

User manual

Crawler excavator
8002 RD



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neuson®

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Introduction

This manual and all supplementary pages must be kept accessible in the proper place in the vehicle!

This manual contains precise operating and handling, maintenance and service instructions as well as the safety instructions required for operation of the vehicle.

- You should be shown how to operate the vehicle by qualified personnel and carefully read the operating instructions before starting the vehicle.
- The safety, reliability, and operational life of the excavator depend primarily on proper operation and maintenance.
- NEUSON accepts no liability according to product liability laws for any initial or subsequent damage which results from improper use and handling of the products supplied by us.
- Please note that claims or complaints cannot be made on the basis of the information provided in these operating instructions including illustrations and data--in particular concerning construction.
- NEUSON reserves the right to make technical alterations and/or improvements without being bound to make these alterations to previously manufactured vehicles.
- We continuously strive to improve our products. It is therefore possible that alterations have been made to the vehicle which could not be included in these operating instructions before they were printed.
- The vehicle described in this handbook corresponds to the technical standards and safety requirements which applied when the manual was printed.
- Subject to technical alteration.


If you have any further questions, please don't hesitate to contact your NEUSON distributor!

1 Guarantee and warranty

Warranty claims may be asserted only against the Neuson distributor.

Moreover, the directions given in this instruction manual must be complied with.

1.1 Identification Plate

○ TYPE	 	○ This identification plate is attached to the front of the chassis.
BAUJAHR		
FZ-IDENT.-NR.		
MOTORLEISTUNG		KW
EIGENGEWICHT		KG
NUTZLAST		KG
ZULÄSSIGES		
GESAMTGEWICHT		KG
ZULÄSSIGE ACHSLAST		KG VORN
ZULÄSSIGE ACHSLAST		KG HINTEN

A *neuson* COMPANY

neuson®

Baumaschinen GmbH

Haidfeldstraße 37, A-4060 Linz-Leonding

Tel.: ++43 (0)732/90590-0

www.neuson.com

1.2 Instructions for ordering spare parts

Use only original NEUSON spare parts!

The complete part number, designation, and number of parts required must be indicated on each order. Indicate the type of machine and works number (see identification plate) on each order.



NOTE:

The ordering party is responsible for delivery errors resulting from incomplete information. Prepare telephone orders carefully. The order should include complete, correct, and clearly legible information on the address, postal code, shipping method, and final destination to prevent unnecessary inquiries and delivery errors.

Please order spare parts only via your NEUSON distributor!

2 Safety



ATTENTION: Read the following safety rules carefully before operating the vehicle.

The safety rules listed here, as well as any other applicable safety rules and regulations, should always be observed.

Operating errors and ignorance regarding potentially dangerous situations that can occur during vehicle operation can lead to injuries.

These potentially dangerous errors and situations are indicated by



CAUTION

in these instructions.

In addition, operating errors and ignorance regarding potentially dangerous situations that can occur during vehicle operation and maintenance can lead to material damage.

These potentially dangerous errors and situations are indicated by



ATTENTION

in these instructions.

Certain instructions are indicated by



NOTE

The disregard of these instructions can lead to operational malfunctions.

The observance of these tips can improve the performance of the excavator.

The national and regional statutory safety and accident prevention regulations are not included in this manual. These regulations are provided in the booklet from the Berufsgenossenschaft Tiefbau (Civil Engineering Trade Association).

The safety regulations must be kept clearly visible and accessible at all times for operating personnel. Read these operating instructions as often as required, until you are familiar with all the safety regulations, operating equipment, components, and functions of the machine.

All safety stickers (notes and warnings) must be kept legible. Clean off dirt. Replace with new stickers if they become illegible!

Operate the vehicle with care and prudence and in such a way that neither you nor your colleagues are put at risk. After you have carefully studied these operating instructions, practice operating the machine in an open space where there is no risk of endangering others or causing material damage.

2.1 Safety rules

The safety of the driver and other persons in the working area depends on the ability of the driver. The driver must therefore be familiar with how the operating levers function.

Every unit has limits to its performance:

Before starting up the crawler excavator the driver must familiarize himself with the characteristics of the excavator, in particular with the speed, the braking and drive systems, the control and drive levers, the safety equipment and instructions, its stability, and its lifting capacity.



ATTENTION:

The NEUSON CRAWLER EXCAVATOR is designed and constructed solely for use with NEUSON attachments or attachments which have been approved by NEUSON. NEUSON can accept no liability for the safety of the driver if the crawler excavator is used with an attachment which is not recommended or approved.

- * For road travel, the vehicle must be equipped according to traffic laws and these laws must be observed.
- * Adapt working speed to local visibility.

- * No one except the driver may occupy the crawler excavator.



RIDING IN THE EXCAVATOR IS PROHIBITED!

- * Use the towing bracket provided to tow the vehicle.
- * The operating area, steps, and grips must be free from oil, dirt, ice, and unsecured objects.

Risk of injury through slipping etc.

- * The lighting system must be checked before and during work in darkness to ensure it is in proper working order.
- * Always keep the windshield and windows clean. Poor visibility can cause accidents.
- * Only operate the crawler excavator from the driver's seat. Always keep the crawler excavator under control.
- * Do not operate equipment too quickly or in an uncontrolled manner.
- * Handle the crawler excavator cautiously and carefully until you are fully familiar with it.
- * Pay attention to the movements of machines and vehicles in the working area.
- * Staying longer than necessary in the danger area (working area) is forbidden.
- * Never operate the attachments (bucket, grab, etc.) above persons.
- * Always wear appropriate protective clothing:
Helmet
Work gloves
Strong work shoes
Reflective items of clothing
And if necessary
Earmuffs
Protective glasses, etc.

- * Make sure you have sufficient knowledge of the working area.
 - Location of supply lines (electricity, water, gas, telephone, etc.)
 - Load bearing capacity of ground
- * Before working in the vicinity of supply lines:
Contact the respective authority (e.g. gas, electricity, etc.)

Your responsibility!

Together determine the appropriate safety measures.
Only do work together with a signaller (better visibility).



ATTENTION: Damaging a cable or pipe can endanger everyone present and the environment.

- * Never dig under the vehicle. When excavating in or near excavated areas, ensure that the walls are well supported!



CAUTION: Risk of collapse

- * Working inside buildings
 - Watch height of ceiling
 - Check load bearing capacity of floor
 - Ensure a flow of fresh air because of exhaust fumes
- * Never drive longer distances with the working equipment (bucket, grab, etc.) fully raised. Lowering the working equipment provides improved visibility and better weight distribution.
- * Never drive across a slope on an incline.
- * Unauthorized persons are not allowed to start or operate the excavator.

- * The driving speed must always be appropriate for the road and ground conditions and the visibility. Allow someone to guide you on roads with impeded visibility and at obstacles.
- * Particular caution is required when working on slopes.



ATTENTION: Angle of inclination of vehicle in all directions of travel: max. 30 degrees

- * Before leaving the vehicle

- **Safe parking:**

Park the excavator on firm, even underground and pull the parking brake. If the excavator is parked in hillside positions or on sloping ground, secure the excavator against moving sideways sufficiently by means of blocks.

When parking on streets, barriers, warning boards, lamps etc. must be used in order that the excavator can also be recognized when it is dark and a collision is prevented.

Before leaving the excavator proceed as follows:

1. Lower the boom and the earth levelling scoop on the ground.
 2. Bring the locking lever in locking position.
 3. Switch off the motor and withdraw the key.
 4. Lock the cabin and the covers.
- Extreme caution is required when working across a slope or changing direction on an incline.



CAUTION: Risk of overturning

- * Never use the weight of the crawler excavator to obtain more force when excavating.



CAUTION: Risk of overturning

- * Use the warning devices (e.g. horn) to warn any personnel working on the crawler excavator or any other persons in the working area before starting the crawler excavator or setting it in motion.
- * Hang a clearly visible and legible "OUT OF ORDER" sign on the vehicle if it is defective or if repairing or tuning the excavator.
- * The engine cover must not be opened while the engine is running. Risk of injury from rotating components and risk of burns.
- * Machine keys

The machine keys delivered by the factory are unrestricted standard keys (driver's cabin and ignition).

This means that they can be duplicated without specifying the vehicle and chassis type identification number.

We'd like to point out that this is no 100% security against theft. For an **adequate theft protection as an option please refer to our price list.**

- * **Make sure you inform yourself about the emergency equipment**
 - First aid kit
 - Fire extinguisher
- * **Where are the safety devices in and on the vehicle?**
 - What is their purpose?
 - How are they operated?
 - Are they in working order?

Control and functions of the emergency switching system

- * The excavator is not intended to be used with lifting equipment and is not for transporting or lifting people **Transporting and lifting people** using the attachments or other equipment is **PROHIBITED!**
- * The excavator arm is not a ramming device! Never attempt to use the attachments to drive piles or other objects into the ground, or to flatten earth, etc. Never attempt to destroy a wall of earth or any other structure by swinging the arm and striking the wall with the attachments.

* Never excavate while driving.

Never dig an attachment into the ground and attempt to excavate by driving and pulling. Never swivel the excavator with lowered attachments and never maneuver the vehicle when an attachment is on the ground.



ATTENTION: The crawler excavator is NOT equipped to be used for lifting or to be fitted with lifting attachments.



NOTE: If substances that could damage the environment or injure people leak out of the crawler excavator, take the necessary measures immediately (e.g., hydraulic oil leaks:
apply an oil binder, place a container under the leak, find and fix the leak, if necessary remove contaminated earth and dispose of it properly).

2.2 EC - Declaration of Conformity

EC-Declaration of Conformity

As defined by the Machinery Directive 98/37/EC, Annex II A

The company Neuson Baumaschinen GmbH
Haidfeldstraße 37
A-4060 Leonding

hereby certifies that the construction equipment

- | | | |
|----|--------------------------------------|--------------------------|
| 1. | Category | Crawler excavator |
| 2. | Mark | Neuson |
| 3. | Type | 8002 |
| 4. | Equipment serial number (per type) | v. Type plate |

complies with the following provisions applying to it	98/37/EG 89/336/EG 00/14/EG
-------------------------------------------------------	-----------------------------------

Applied harmonized standarts	EN 292-1:1991, EN 292-2:1995 EN 474-1:1994, EN 474-5:1996 EN 982:1996
------------------------------	-----------------------------------------------------------------------------

Applied national technical standards and specifications

Type	Measure Sound Power Level	„A“ weighted Sound Power Level	Certificate No.
8002	96,1	97,0	OR/01519/01

The notified body	TÜV Anlagen und Umwelt GmbH Westendstraße 199 D-80686 München
-------------------	---------------------------------------------------------------------


The notified body according to Annex VII	Fachausschuß Tiefbau Landsbergerstr. 309 D – 80687 München
------------------------------------------	------------------------------------------------------------------

was engaged for voluntary type-examination

Examination certificate No.)	01059-E
------------------------------	---------

The option Neuson Vario deviates from standards EN 474-1:1994 and EN 474-5:1996.
Other than specified in standard EN 474-5:1996 any exceeding of stability is announced by a warning device.

Leonding, (v. delivery note)



 (Hans Neunteufel, executive director)

3 Specifications

3.1 Technical Data Crawler Excavator 8002 RD

Principal Data

Principal Data 8002 RD	Standard	Vario
Unladen weight with cab	7900 kg	8520 kg
Height to top of cab	2570 mm	2700 mm
Width	2150 mm	2150 mm
Length	3800 mm	3800 mm
max. digging depth	4400 mm	4270 mm
max. digging height	7220 mm	7350 mm
max. dumping height	5180 mm	5310 mm
max. digging radius	7240 mm	7240 mm
Force per bucket tooth	4960 kp	4960 kp
min. rear swiveling clearance	1590 mm	1590 mm
min. excavator arm clearance	1670 mm	1670 mm
Excavator arm angle left	80°	80°
Excavator arm angle right	50°	50°

Driving and swiveling specifications

Driving and swiveling specifications 8002 RD	
2 speeds	4 and 6 km/h
Climbing ability	30° (58%)
Track width	450 mm
Number of track rollers per side	5 per side
Track tensioner	Grease cylinder with tension spring
Ground clearance	390 mm
Ground pressure (of excavator when level)	0,38 kg/cm ²
Swiveling speed of revolving superstructure	9,5 revolutions per min

Engine

Engine 8002 RD	
Model	YANMAR 4TNE 98-NSR
Type	Water-cooled 4 cylinder diesel engine
Capacity	3318 cm ³
Horsepower in DIN	45,6 kw 62 hp
Revolutions per minute	2200 rpm
Battery	12V 88Ah
Diesel tank	90 l
Motor oil	10,2 l
Coolant capacity	8,7 l

Hydraulic system

Hydraulic system 8002 RD	
Pump	Double axial piston pump +gear pump
Pump capacity	80 + 80 + 50 l/min
Operating pressure (working and driving)	300 bar
Operating pressure (swivel unit)	250 bar
Hydraulic oil cooler	standard
Hydraulic tank (system capacity)	122 l

Dozer blade

Dozer blade 8002 RD	
Width	2150 mm
Height	540 mm
max. height above ground level	540 mm
max. depth below ground level	450 mm

Bucket (Standard)

Bucket (Standard) 8002 RD	
Width	750 mm
Volume	260 l

3.2 Noise emissions Crawler Excavator 8002 RD

Certified according to EEC - design test (86/662/EEC)

Noise emissions	8002
Sound level (L_{WA})	96 dB(A)
Sound pressure level (L_{PA})	78 dB(A)

**ATTENTION:**

No alterations that would lead to an increase in noise emissions may be made to the excavator.

3.3 Vibration levels

Vibration levels are in accordance with EEC guidelines.
89/392/EEC (Appendix I, Point 3.6.3)

3.4 Fire extinguisher

There is a place in the toolbox for a fire extinguisher.

3.5 Stickers

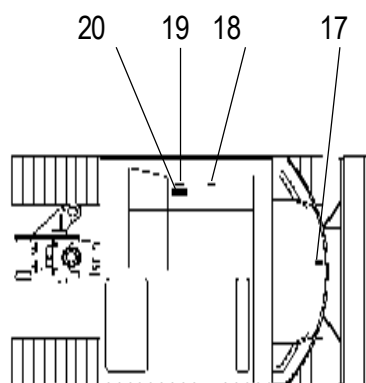
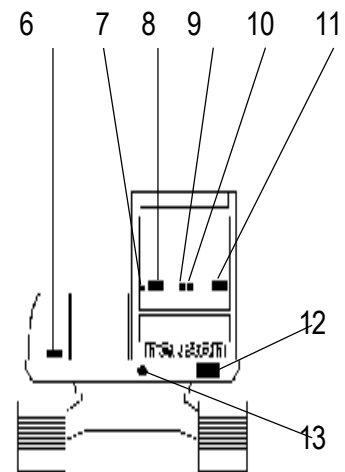
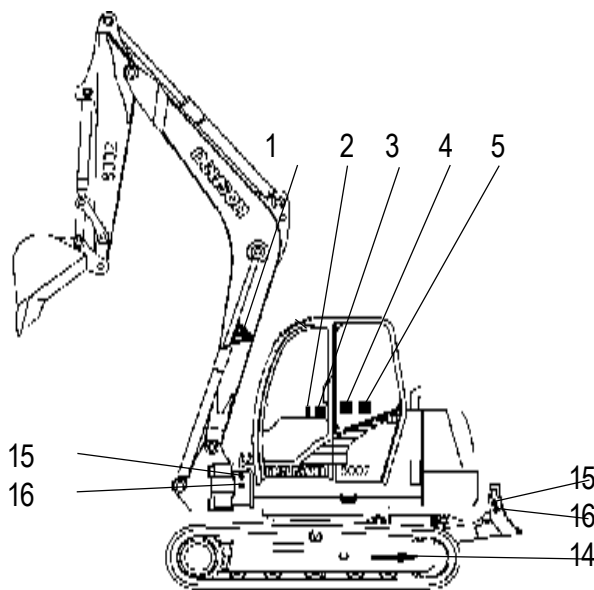


ATTENTION:

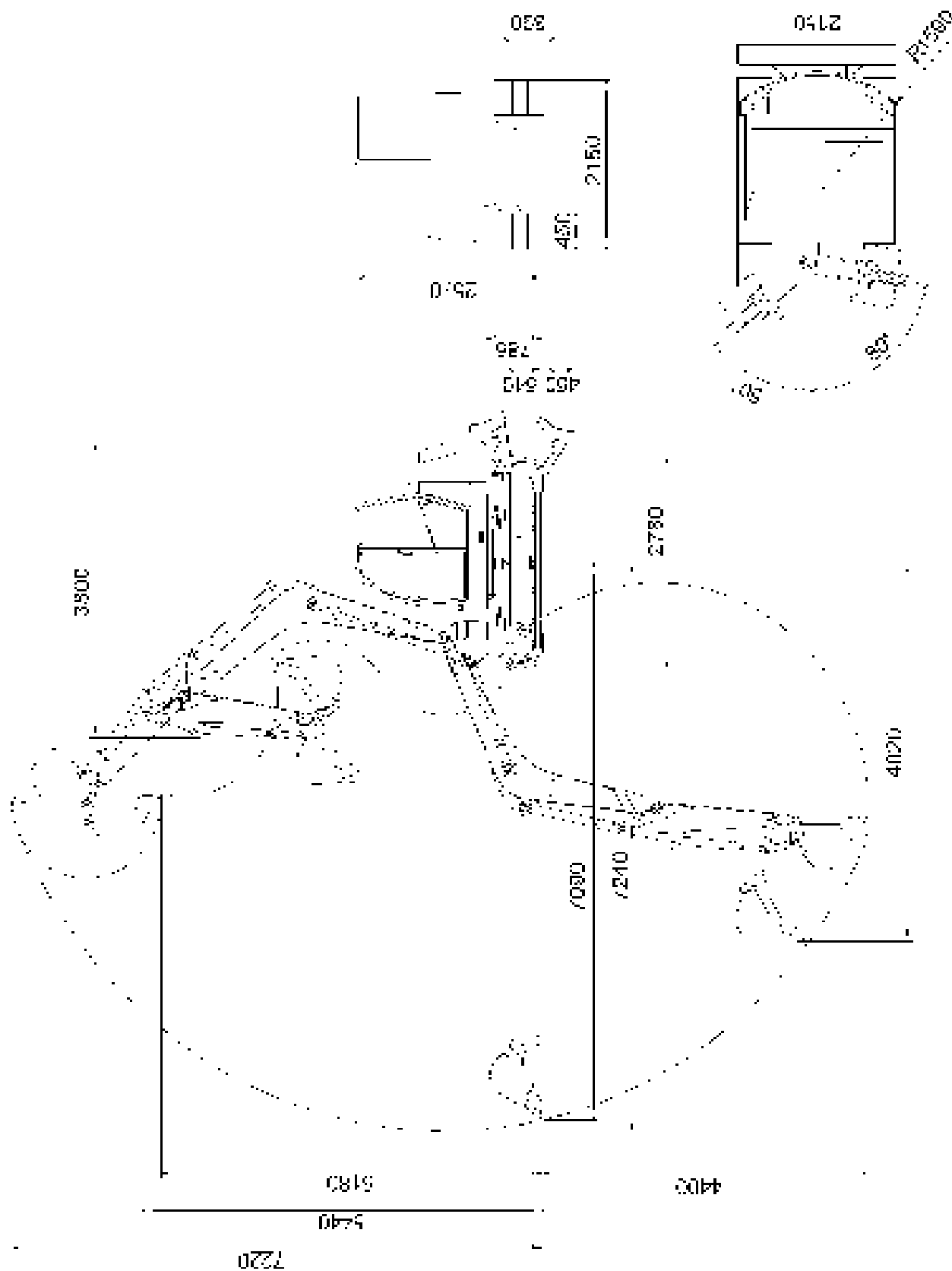
All safety stickers (notes and warnings) must be kept legible.

Clean off dirt

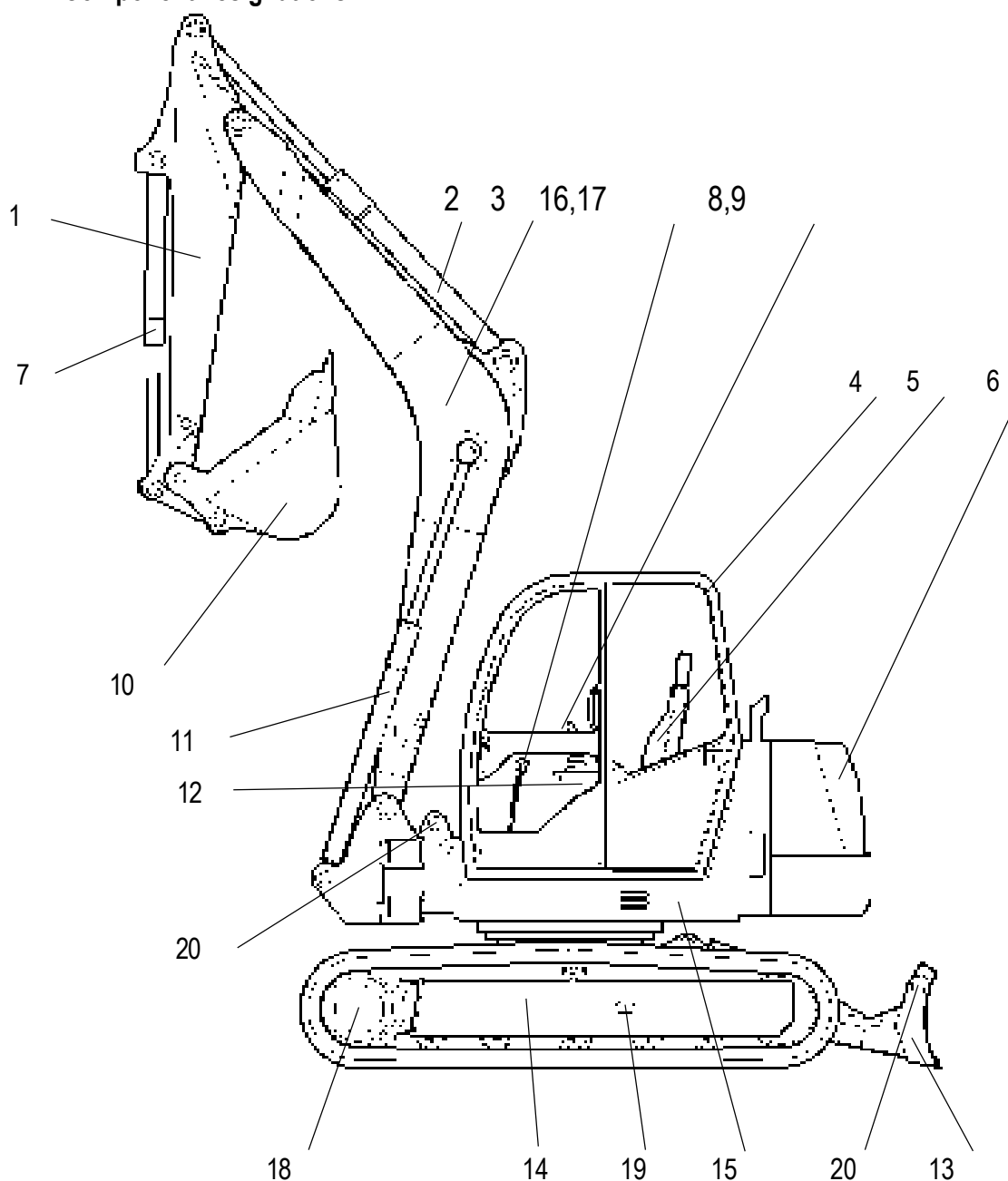
Replace with new stickers if they become illegible!



Stickers 8002 RD	
1	Warning symbol
2	Symbol: "Read operating instructions
3	Cleaning
4	LWA 96
6	Lubricant recommendations
7	Dozer blade up/down (windshield)
8	Boom up/down, Bucket open/closed, Horn (windshield)
9	Travel right, forward, reserve (windshield)
10	Travel left, forward, reverse (windshield)
11	Stick out/in, Swing (swivel) left/right (windshield)
12	Identification plate with CE-Symbol
13	Environmental symbol (blue angel)
14	Direction arrows (left and right on the guard)
15	Fastening points for lifting the excavator (swiveling console and right and left on dozer blade)
16	Tie down points (swiveling console and left and right on dozer blade)
17	Symbol: "Danger" (Do not open while engine is running)
18	Diesel
19	Hydraulic oil
20	Attention hydraulic tank under pressure



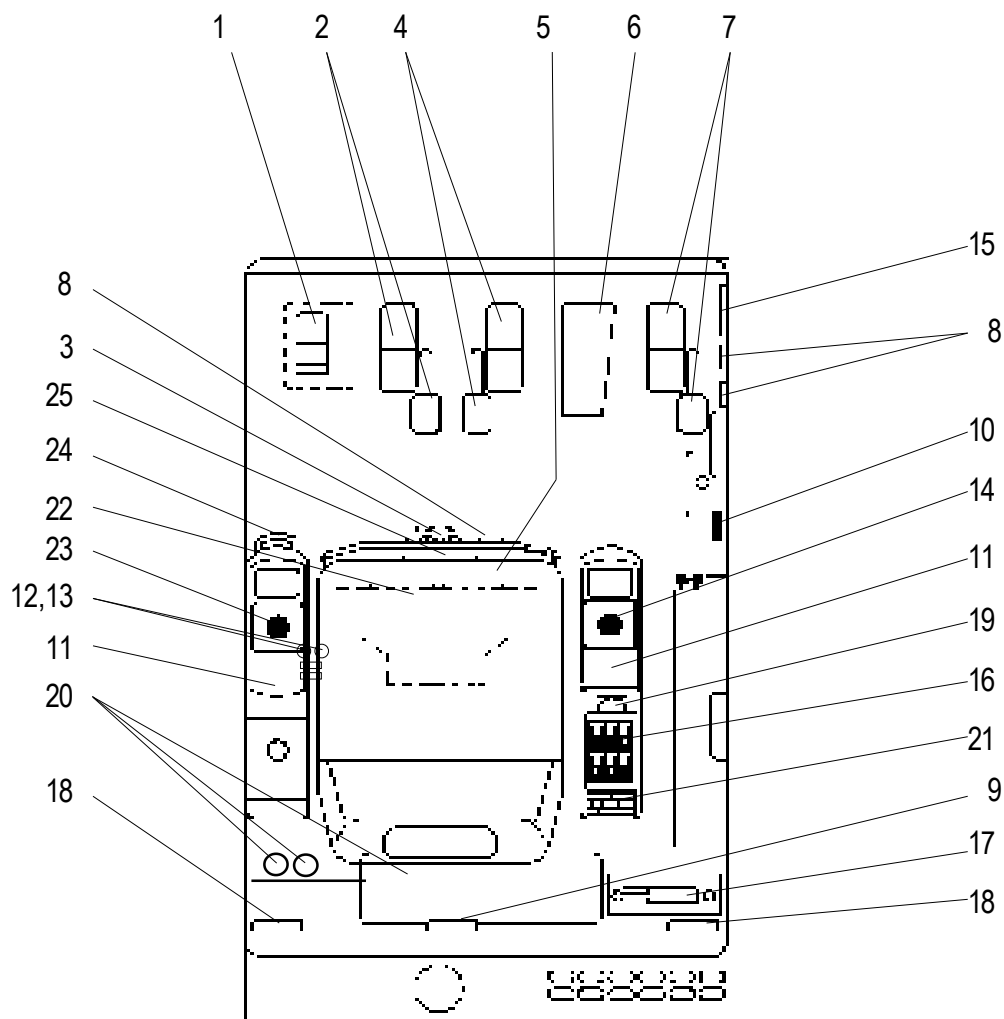
4 Component Designations



Component Designations 8002 RD

1	Bucket stick	11	Boom cylinder
2	Bucket stick cylinder	12	Steering control console
3	Boom	13	Dozer blade
4	Cab	14	Undercarriage
5	Driver's seat	15	Chassis
6	Engine cover	16	Left drive lever
7	Bucket cylinder	17	Right drive lever
8	Left control lever	18	Traveling drive
9	Right control lever	19	Protective cover for track tensioner
10	Backhoe bucket	20	Eyes for lifting and tying down excavator

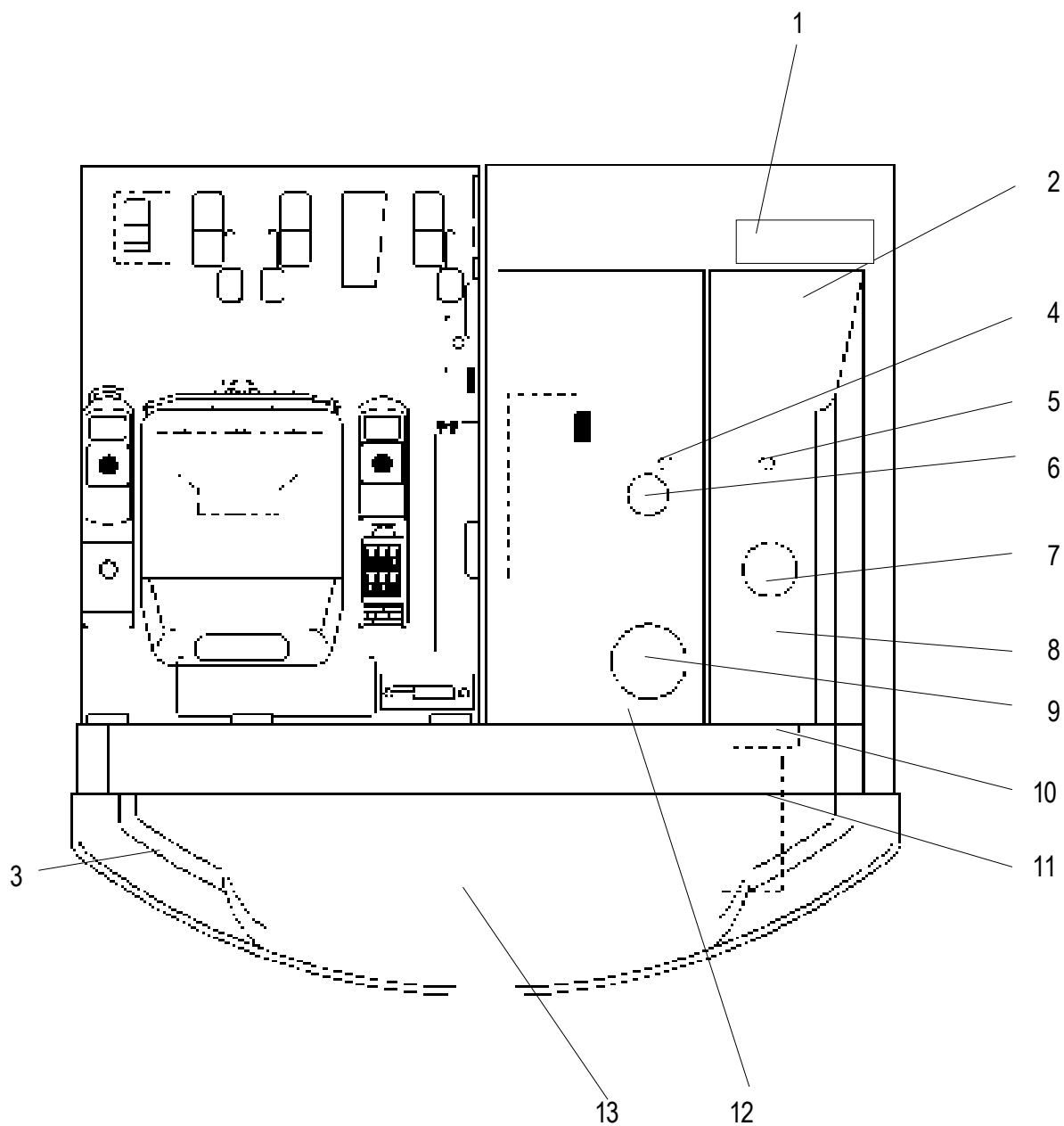
4.1 Cab equipment and controls



Cab equipment and controls

1	Hammer + covering	14	Right control lever for boom and bucket
2	Drive pedal left and switch for overdrive	15	Ashtry
3	Seat spring tension adjustment	16	Instrument panel
4	Drive pedal right and feet pedal	17	Radio
5	Seat back adjustment	18	Speaker
6	Feet rest	19	Ignition lock
7	Lever for dozer blade with feet pedal	20	Storage
8	Heating and air vents	21	Fuse box
9	Cab lighting	22	Heating
10	Accelerator	23	Left control lever for bucket stick and swiveling; swing arm
11	Armrest	24	Lever to fold back left steering control console
12	Cable to open side cover	25	Seat adjustment
13	Cable to open engine cover		

4.2 Excavator components



Excavator components 8002

1	Control block	8	Diesel tank
2	Hydraulic oil level indicator	9	Return filter
3	Place for quencher	10	Diesel pump
4	Drain plug oil tank	11	Battery
5	Drain plug diesel tank	12	Oil tank
6	Opening for filling hydraulic oil	13	Engine cover
7	Tank support		

Work lights



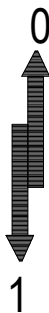
There is 1 work light with a H3/55W Halogen bulb on the arm of the excavator. This light can be turned on and off with the switch on the instrument panel (see section 6 for the position of the light switch).

There are four more lights with H3/55W Halogen bulbs on the chassis (2 in the front and 1 on each side).

The 2 front headlights are on when the switch is the Position 1.

The side lights are turned on by pushing the switch to Position 2. (see section 6 for the position of the light switch).

Accelerator



With the accelerator lever the engine speed can be varied between

Position 0 idle (neutral 1100 rpms) and

Position 1 2200 rpms

Driver's Seat

The following options are available to change the position of the driver's seat:



CAUTION: Only adjust seat when the excavator is stopped.

a) Adjustment of the seat position

The seat can be adjusted horizontally back and forth using the seat adjustment lever (see 25 under Cab Controls 4.1). When the lever is released, the seat locks in the appropriate position.

b) Adjustment of the seat back position (in the middle of the seat)

The seat can be leaned forward and back (see 5 under Cab Controls 4.1) using the seat back adjustment lever.

c) Adjustment of the seat spring tension (in the middle of the seat)

The seat spring tension can be adjusted to accommodate (see 3 under Cab Controls 4.1) the needs of different operators:

- for lighter persons
- for medium persons
- for heavier persons

Heater, Heating and Air Vents

The heater is located under the driver's seat and can be turned on and off with the heater switch. The heating vents are in the front of the cab and under the driver's seat.

Windshield Wipers

The motor for the windshield wipers is located inside the cab at the top of the front windshield. The windshield wipers can be turned on and off with a switch on the instrument panel.

4.3 Hydraulic system

Emergency operation of attachments

Turn on ignition and use servo pressure valve (emergency operation) to lower the attachments.

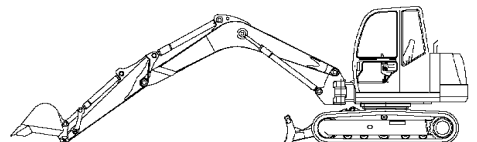
Release of residual pressure

- Turn off engine
- Turn ignition on
- Activate servo pressure valve
- **Slowly** open the **hydraulic-oil cap** (to allow pressure to escape)



CAUTION: Hydraulic system under pressure.

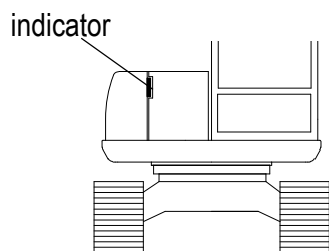
Check hydraulic oil level



Position of arm while checking hydraulic oil level:

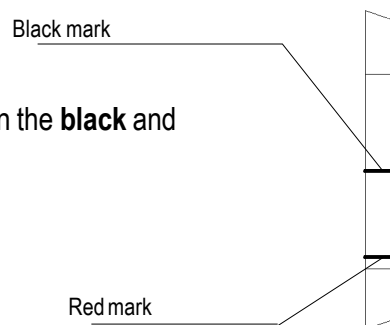
- Excavator should be on level ground
- Extend arm
- Extend bucket (bucket cylinder fully retracted)
- Completely retract bucket stick cylinder
- Lower dozer blade
- Turn off engine

Check the hydraulic-oil level in the indicator (visible by opening the valve cover)

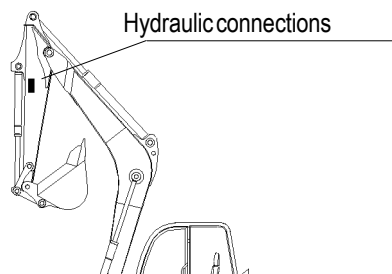


The oil level should be between the **black** and **red** marks.

Refill hydraulic oil
as necessary

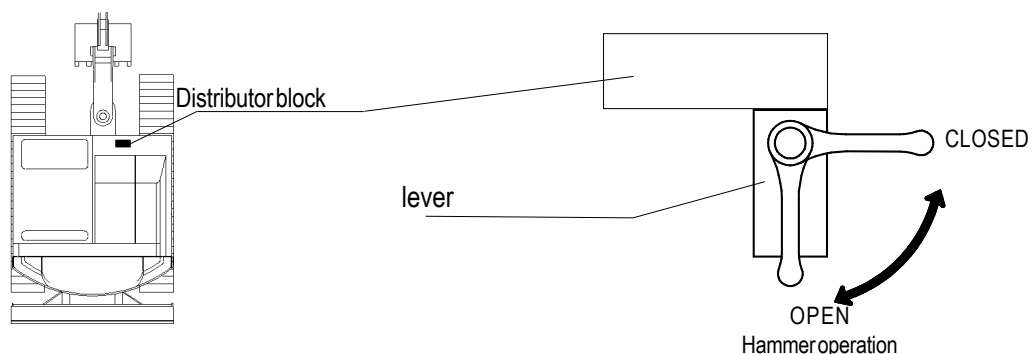


Hydraulic connections for additional attachments



Hydraulic connections for supplying additional attachments are located on the left and right side of the bucket sticket.

The hydraulics supply for additional attachments can be activated by turning the lever on distributor block.



5 Safety Equipment

5.1 Parking Brake and Locking Mechanism

The brakes and parking brake as well as the locking mechanism are automatically activated when the excavator is at a complete stop (no pilot control pressure).

The brakes and locking mechanism only release when a drive or control lever is activated (pressure builds up).

5.2 Seat



CAUTION:

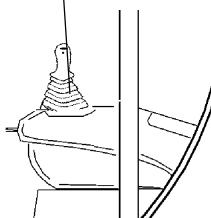
The steering control console **MUST** be folded back when getting into or out of the crawler excavator in order to block the function of the hydraulic system.



ATTENTION:

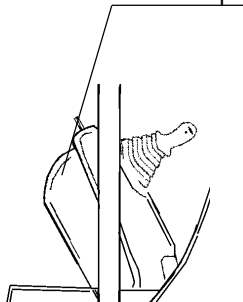
Console down = Work and hydraulic functions operational
Console up = Work and hydraulic functions interrupted

Console



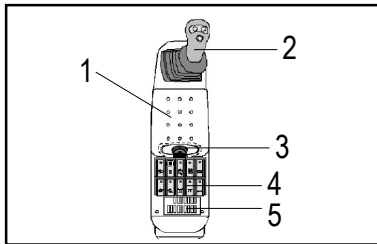
Work functions
operational

Console up

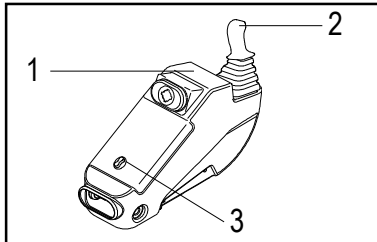


Work functions
interrupted

6 Instrument Panel Functions

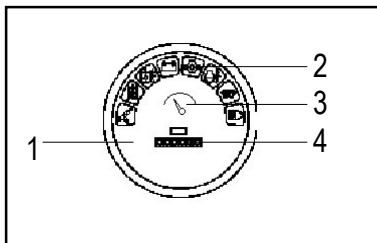


- 1 Dashboard right
- 2 Control lever right
- 3 Ignition lock
- 4 Instrument panel
- 5 Fuse box



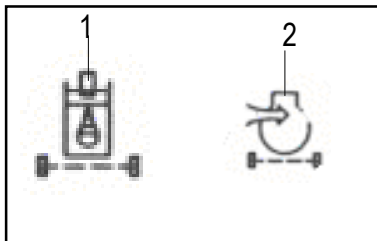
- 1 Dashboard left
- 2 Control lever left
- 5 Cold/hot adjustment

Round display element

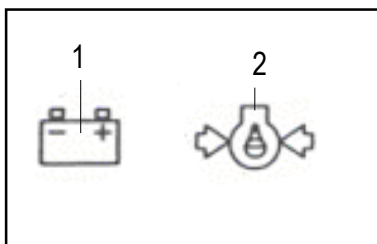


- 1 Round display element
- 2 Lamps
- 3 Fuel gauge
- 4 Operating hours meter

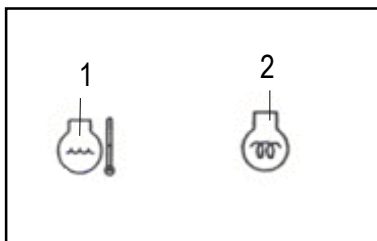
Lamps



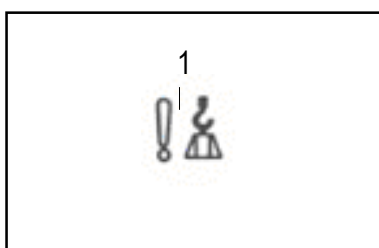
- 1 Clogging indicator for hydraulic filter (o)
- 2 Clogging indicator for air filter



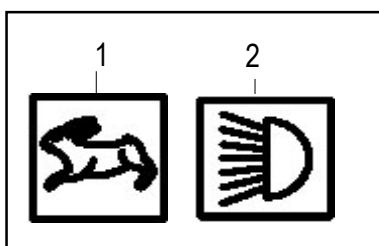
- 1 charge control
- 2 Motor oil pressure



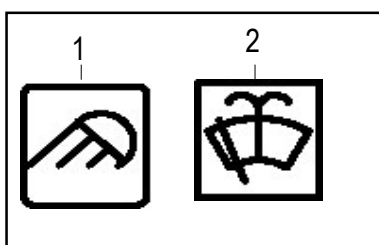
- 1 Water temperature indicator
- 2 Preheating pilot lamp



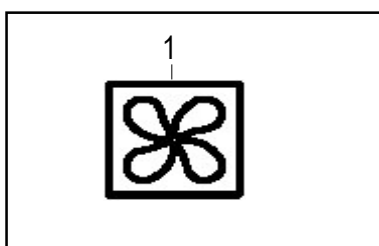
1 Overload pilot lamp



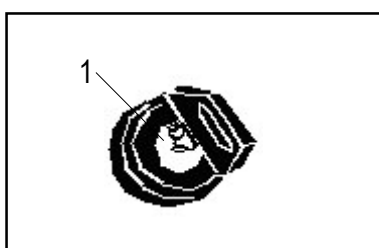
1 Switch for overdrive
2 Switch for chassis headlights



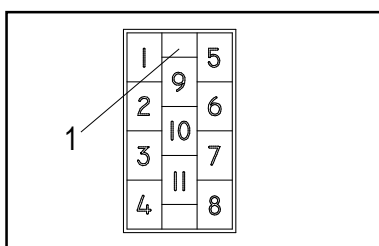
1 Pilot lamp for headlights
2 Switch for screen wiper and washer



1 Switch for cabin heating



1 Ignition lock with two keys



1 Fuse box

6.1 Fuse box

The fuses are integrated into the instrument panel.

Order of fuses

1		5
2	9	6
3	10	7
4	11	8

Arrangements of the fuses in the fuse box 8002 RD		
No.	Capacity (A)	Use
1	7,5	Overdrive (toggle switch and drive lever)
2	7,5	Windshield wipers and washer
3	30	Turn engine off (stop solenoid)
4	7,5	Switch and Instrument panel lighting
5	15	Front work lights
6	15	Heater, horn
7	10	Turning lights - free
8	10	Cab lighting, Socket, Radio
9	10	Alternator, Starter
10	15	Fuel pump - free
11	10	Change-over valve, Safety solenoid valve

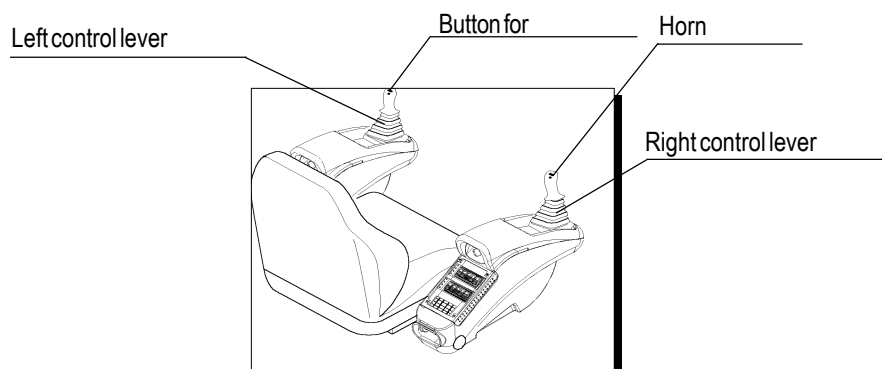
The main fuse (50 amps) for the ignition and the glow plug is located in the relay box. Another main fuse (40 amps) is located in the right control console. This is the fuse for the light on the arm, the side work lights and the rear work lights (optional).

The time relay fuses for the rear work lights (optional) and the main relays for the work lights are also located in the right control console.

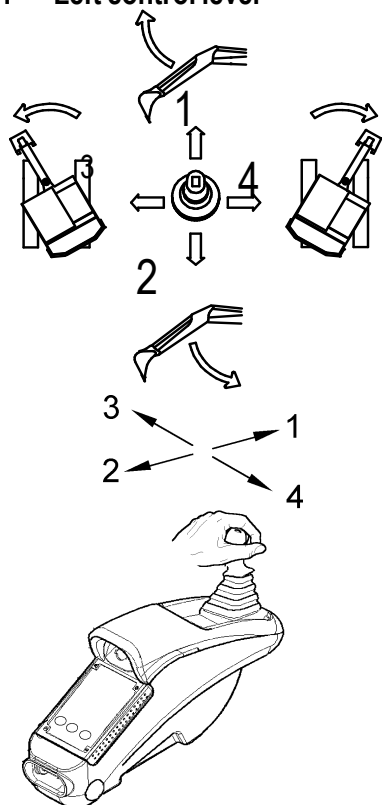
7 Swinging and swiveling the excavator equipment

The excavating equipment is operated using the left and right control levers on the driver's seat console.

To operate the bucket stick and swivel the superstructure use the **left** control lever. The boom and bucket are operated using the **right** control lever.



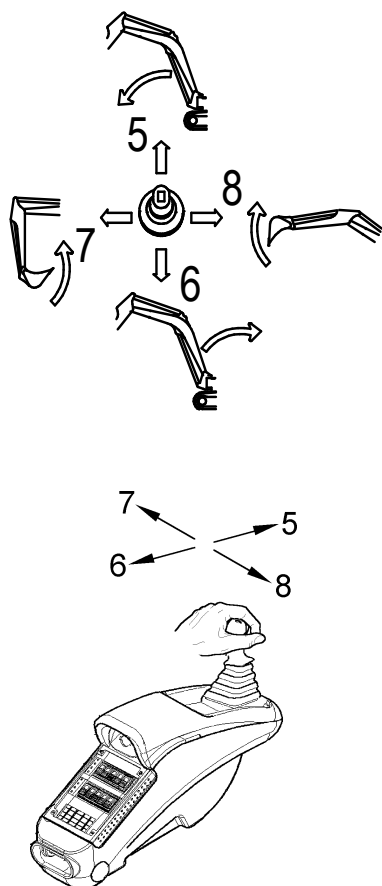
7.1 Left control lever



- 1 forward
- 2 backward
- 3 left
- 4 right

bucket stick away from excavator
 bucket stick toward excavator
 turn superstructure to the left
 turn superstructure to the right

7.2 Right control lever

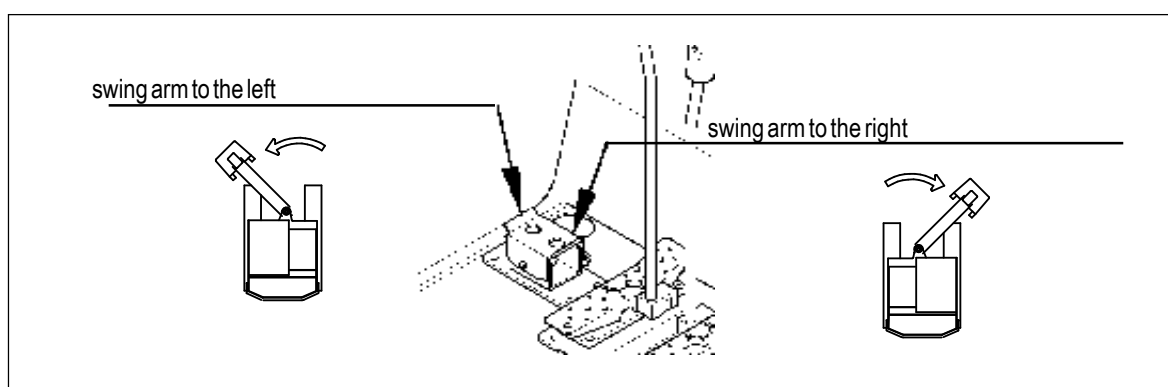
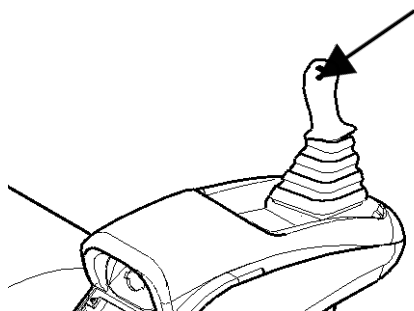


- 5 forward
- 6 backward
- 7 left
- 8 right

lower boom
 raise boom
 bring bucket in
 extend bucket

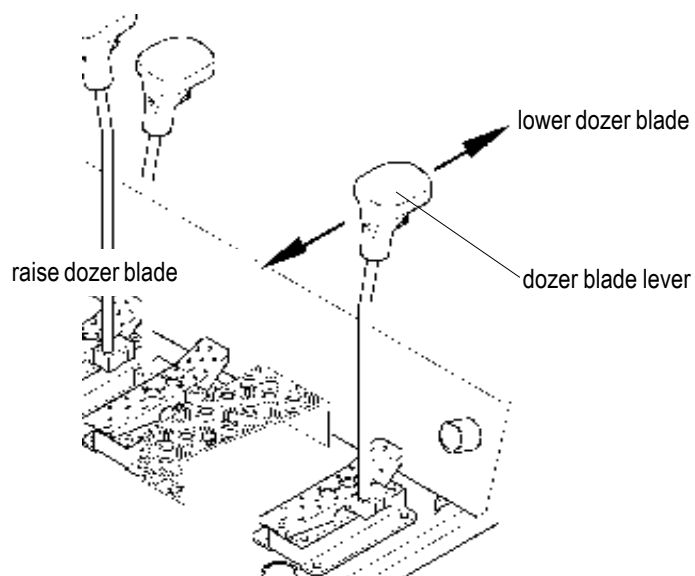
7.3 Excavator arm movements

In order to swing the arm using the hammer pedal, the button on the left control lever must also be pushed in.



7.4 Dozer blade

The dozer blade can be raised or lowered using the dozer blade lever.



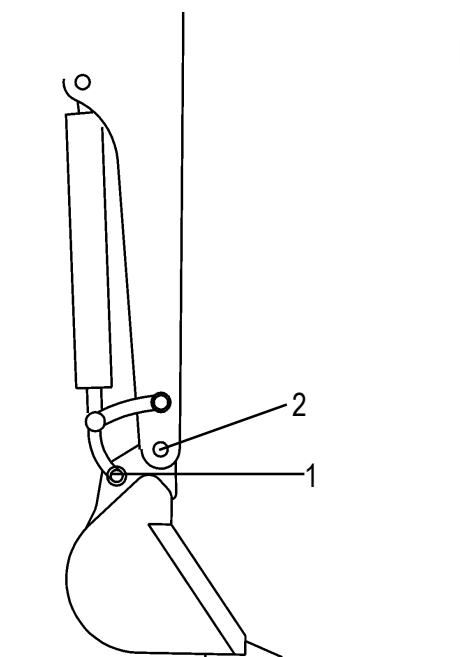
7.5 Changing attachments



ATTENTION: To change attachments, the excavator **MUST** always be in a depressurized state.

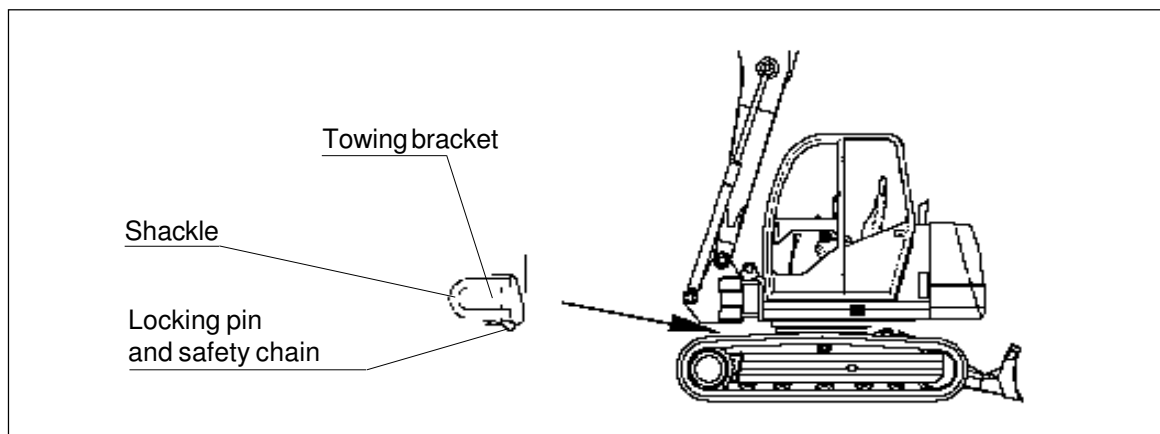
Place attachments in a depressurized state on the ground and remove locking pins and bolts.

Remove locking pins 1,2 and bolts 1,2



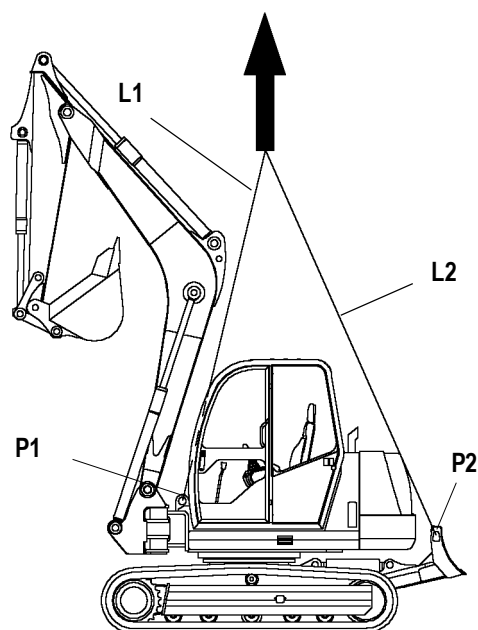
8 Towing equipment

To tow the excavator use the towing equipment provided.
Only use the towing bracket for towing.
Secure the shackle with the locking pin.



Max. towing capacity of towing bracket: 150 kN

9 Lifting the Crawler Excavator



Raise arm and dozer blade.

Fasten rope, chains etc. to the swiveling console and to the dozer blade on the left and the right (3-point suspension).

To prevent damage, ensure there is enough distance between the ropes/chains and the excavator.

The fastening points are indicated with stickers.

Ensure that the ropes/chains etc. cannot come undone.

Minimum force required per lift 80 kN

L1 = about 3.5 m L2 (2X) = about 4 m

P1 ... Fastening point swiveling console

P2 ... Fastening points left and right side of dozer blade

10 Excavating options

10.1 Digging

Optimal stability while excavating

Place the dozer blade against the ground for additional stability. The dozer blade can be lowered using the dozer blade lever located on the right side of the driver's seat.

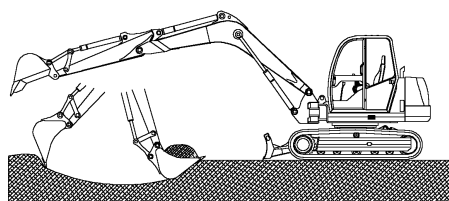
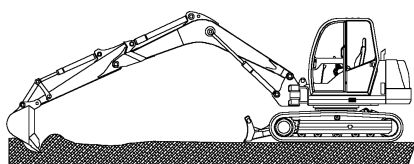
Never dig under the vehicle. When excavating in or near excavated areas, ensure that the walls are well supported!



CAUTION: Risk of Collapse

In order to obtain maximum performance, the excavator arm should not be fully extended.

Remove the excavated material with long, flat movements of the excavator arm.



10.2 Excavator arm swing angle

The excavator arm can be swung 50° to the right and 80° to the left from its basic position. This makes excavation of trenches along walls, fences, etc. possible.

10.3 Bulldozing

The dozer blade can be raised or lowered using the dozer blade lever.

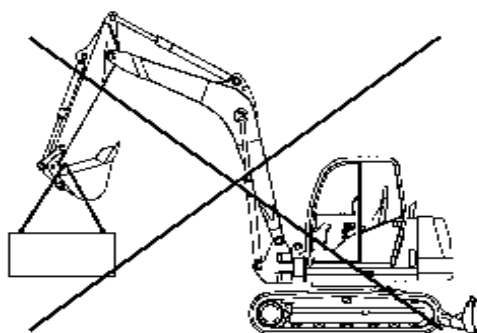
To bulldoze the boom should be completely raised and the bucket turned inward.

It is possible to push the ground to the front and to the side.

Raise the dozer blade somewhat if resistance becomes too strong.

10.4 Lifting

ATTENTION: THE CRAWLER EXCAVATOR IS NOT EQUIPPED TO BE USED FOR LIFTING OR TO BE FITTED WITH LIFTING ATTACHMENTS.



An optional overload warning indicator is available for use when lifting.

10.5 Cab protection

If the excavator is being used for overhead work, quarry work, etc. it must be equipped with extra protection (FOPS/Front Guard) against falling objects.

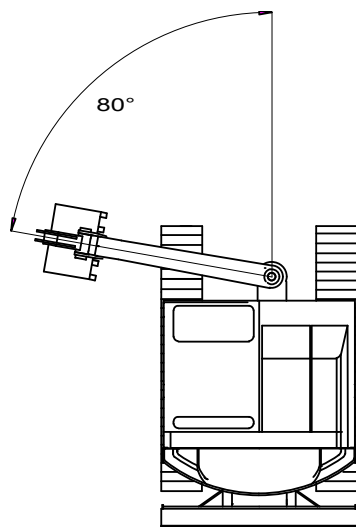
FOPS and Front Guard is available as an option.

10.6 Stability

RISK OF OVERTURNING!



CAUTION: Always ensure adequate stability when working with the crawler excavator. Particularly when working to the side with attachments (bucket, grab, etc.). Changing the attachments alters the stability (weight).



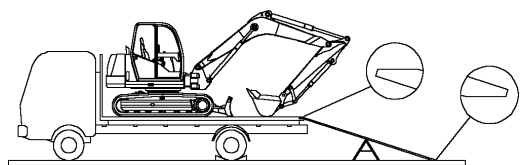
E.g.: One of the situations (excavating to the side with the arm swung to the max. angle) in which overturning to the left is possible.

11 Transport instructions

- Use only transport vehicles which are in proper working order and are approved for use on public roads.
- When using ramps to load the excavator onto the transport vehicle
 - do not exceed an incline of 18°
 - the ramp width must be at least 1 or 2 times the width of the tracks
 - clean dirt, mud, ice, and snow from the ramps and the tracks



NOTE: The ramp ends should be bevelled (see below) to prevent damage to the rubber tracks.



- Attach the ramps securely to the transport vehicle to prevent them from slipping off. (e.g. hook on)
- As a safety precaution, provide additional support in the middle of the ramps.
- Load the machine on solid, even ground.
- When loading, apply the parking brake of the transport vehicle securely and place chocks under the wheels.

11.1 After loading

- Lower the dozer blade and the excavator arm onto the loading surface of the transport vehicle. Stop the engine.
- Lock the cab. The swivel lock is automatically applied when the excavator is at a complete stop.
- After loading place chocks under the tracks of the crawler excavator and secure it to prevent slipping, overturning, and moving (tie down).
- Tie down the excavator at the points indicated on the stickers.

12 Things to check before starting the excavator

Checking the excavator before operating it can prevent malfunctions during operation. Therefore never neglect these checks.

12.1 Visual inspection

Check:

- * Pressure hoses, hose connections, and hydraulic cylinder seals for oil leaks
- * The radiator for water leaks
- * Engine for water and oil leaks
- * Battery connections

12.2 Check motor oil

Check the oil level using the dipstick. The vehicle must be horizontal and the engine off.



NOTE: The marks on the dipstick indicate the minimum and maximum oil levels.

Top off engine oil if necessary by opening the cap and adding oil from a clean container.



ATTENTION: See the lubricant list for engine oil grade. Only use engine oil of the same quality.

12.3 Check hydraulic oil level

Check the hydraulic oil level in the indicator in the main valve area.

Position of excavator arm while checking hydraulic oil levels:

Extend arm

Extend bucket outward and lower it to the ground (piston rods in cylinders)

Turn off engine

Refill hydraulic oil as necessary. Open the cap and refill the hydraulic oil from a clean container. Close the cap.



CAUTION: Release residual pressure when working on the hydraulic system!

The hydraulic oil quality can be checked on the list of lubricants.
Always only use the same quality hydraulic oil.

12.4 Check coolant level



CAUTION: Check coolant level only when engine is cold.

Check coolant level in the reservoir.

Top off coolant if necessary. Turn the radiator cap counter-clockwise and remove.



ATTENTION: If coolant is added, ensure the water/antifreeze mixture is correct.

12.5 Refuelling

After operation, always refill the fuel tank until it is full. This is to prevent the formation of water condensation in the interval between uses.

Ensure that fuel is not spilt when refuelling.



ATTENTION: Make sure that you never run out of fuel, otherwise you must bleed fuel system.

12.6 Check safety equipment

Check the brakes and swivel lock to ensure they are functioning properly.

The brakes and swivel lock are automatically activated when the excavator is at a complete stop (no pilot control pressure).

The brakes only release when a drive or control lever is activated (pressure builds up).

13 Starting the excavator

- Adjust driver's seat (spring tension, position, seat back).
- Place all switches and levers in their neutral position.
- Insert the key in the ignition and turn.

Starting procedure

Accelerator in idling position.

Step 1: Ignition on



NOTE: Oil pressure and charge indicator lights should come on--warning light test

Step 2: Turn key to warm up glow plug, hold key for about 15 seconds

Step 3: Start

- Release ignition key as soon as the engine is running.



NOTE: The ignition key automatically returns to the ON position.

Do not engage the starter for more than 10 seconds at a time.

If the engine does not start, pause for at least 30 seconds to let the battery recover before trying again.

Leave the key in the ON position during operation. If the key is turned to "O", the engine is turned off.



ATTENTION: Indicator lights (oil pressure and charge indicator) should go out after starting.



ATTENTION: If they do not go out, or if one comes on during operation, stop the engine and have maintenance personnel or the repair shop look into the problem.



ATTENTION: Let the engine warm up for approx. 5 minutes to allow the hydraulic oil to get hot.

13.1 Jump starts (with jumper cables)

If the battery is dead, another battery (12 Volt) can be used in conjunction with suitable jumper cables to start the excavator.



ATTENTION: The following procedure requiring two people is the only safe method for bridging a dead or run down battery. Two people are required so that the jumper cables can be removed without the driver having to leave the cab.



CAUTION: Never attempt to connect a jumper cable when the battery to be charged is frozen. This can cause damage or an explosion. Follow the instructions completely and in the correct order to avoid injury.

Check before connecting batteries:

The good battery must also be a 12 volt battery.

Examine jumper cables and terminals for damage, rust, etc.

1. Turn the ignition keys of both vehicles to "off" and ensure that the operating levers of both vehicles are in "neutral position" and that the vehicles are not touching.
2. Remove the battery filler caps and ensure that the battery fluid level is correct. A clean cloth must also be placed over the openings to prevent battery acid from boiling over.



CAUTION: If acid splashes onto skin, eyes, or clothing, wash immediately with large amounts of water.

3. Use jumper cables to connect the positive terminals (+) of the batteries. Ensure that cable and terminal are properly secured.



CAUTION: Never attempt to connect the jumper cable directly to the starter solenoid switch, always connect it to the positive terminal (+) of the excavator battery.

Connection of the jumper cable to the negative terminal (-) should *always* be carried out *last*.

4. Connect a jumper cable to the negative terminal (-) of the dead or run down battery.

5. Finally, connect the jumper cable to the negative terminal (-) of the battery of the assisting vehicle.

Ensure that cable and terminal are properly secured.

Turn the ends of the jumper cables around the battery terminals several times to ensure good contact.

6. Now start the excavator. If it does not start immediately, start the engine of the assisting vehicle to avoid draining the starting battery.

7. After the excavator has been started and is running evenly, have another person

- disconnect the jumper cables from the battery of the started engine, first disconnect cable from negative terminal (-) and then from positive terminal (+), and
- disconnect the jumper cables from the battery of the assisting vehicle, first disconnect cable from negative terminal (-) and then from positive terminal (+).

Ensure that the cables do not short circuit (touch).

Ensure that the excavator alternator has sufficient time to charge the battery before setting the excavator in motion or stopping the engine.

Make sure the cloth is removed and screw the filler caps back on.

14 Driving the crawler excavator

The front is the side with the dozer blade.
Raise the excavating bucket and the dozer blade.

14.1 Driving

The excavator can be controlled using the drive levers or the foot pedals.

Forward: Push left and right drive levers forward

Reverse: Pull left and right drive levers toward seat



ATTENTION:

If a 180° rotation has been carried out (dozer blade at rear), the drive levers have the opposite effect.

Travel on dangerous ground and on slopes



CAUTION:

Due to the narrow width of the excavator, extreme caution is required when traveling on dangerous ground or on slopes. On a slope which is steeper than 15° the superstructure must never be swivelled crosswise to the direction of travel. When traveling, the working equipment (bucket, grab, etc.) must always be kept 30 - 40 cm above the ground and the dozer blade must be raised.

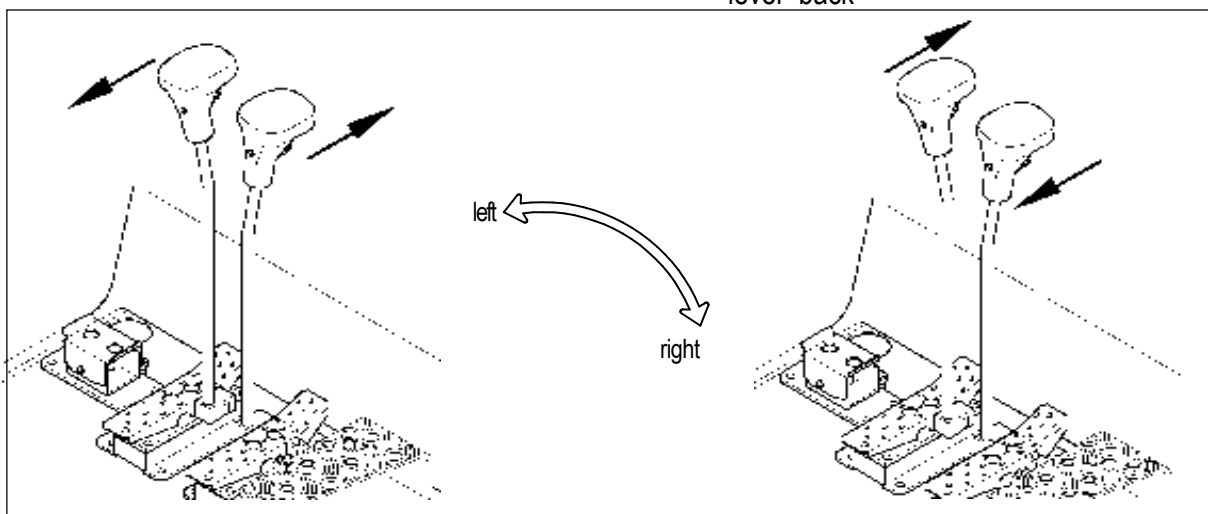
14.2 Turning

Turning left:

Pull left drive lever back and push right drive lever forward

Turning right:

Push left drive lever forward and pull right drive lever back

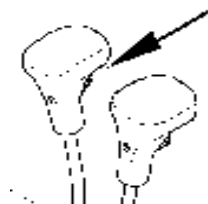


14.3 Traveling speeds

Slow



Fast (Overdrive)



- a) The gears are regulated by a switch on the instrument panel.
- b) There is an additional switch on the left drive lever to switch quickly to overdrive while driving.



ATTENTION: Do not use the overdrive when traveling around a curve!

- c) The speed is controlled with the drive lever (pedal).
Pressed all the way = max. speed for that gear.

15 Shutting down

- Stop the machine.
- Lower bucket and dozer blade to the ground.
- Let engine idle (Accelerator position "0").
Turn off ignition.



ATTENTION: Never turn off the engine at full power. Allow the engine to idle for at least 1 Min. before turning the engine off.

- Turn the key to the "O" position and remove it before leaving the vehicle.



CAUTION: Unauthorized use of the excavator must be prevented.
Lock the cab.

- Park on level ground.
If the excavator has to be parked on an incline, place chocks under the tracks.

16 Care and Maintenance

16.1 General

Care and maintenance have a lot to do with the reliability and operating life of the excavator.

Washing: during the first three months the excavator should only be cleaned with cold water (no high-pressure or steam cleaning systems); after the first three months keep the spray nozzle at least 30 cm from the vehicle, the water temperature should not exceed 60° C and no aggressive cleaning agents should be used.

It is in the owner's interest to adhere to the maintenance schedule.

The manufacturer requires that all prescribed maintenance work be carried out. Neglected maintenance will result in limitations on the guarantee.

See the engine operating instructions for engine maintenance.

The use of lubricants other than those recommended by the manufacture invalidates all warranty claims.

Before you undertake any maintenance or repair work, find out if there is any damage to the vehicle.

Lower attachments to the ground before starting maintenance or repair work. Engage locking and safety levers.

- Release residual pressure from hydraulic system
- Allow engine to cool (radiator fluid is hot)

If the machine must be raised to carry out work, make sure it is secured (supported) appropriately.

Make sure there is an adequate flow of air before undertaking maintenance or repair work in a closed room.

Dispose of oil, oil filters, etc. in accordance with environmental laws.

When working on or under the excavator, put a warning sign on the seat or somewhere that it is clearly visible and legible.

Remove the key from the ignition.

Never work in a damp area or with wet hands (or gloves) on the electrical system.

Remove the negative (-) pole from the battery when working on the electrical system.

If sealing elements (O-rings, flange seals, etc.) are removed, always replace them with new ones.

After tightening bolts, lock them against rotation.

Always clean dirt and oil residues from the vehicle after maintenance or repair work. **RISK OF SLIPPING!**

The hours indicated for servicing intervals correspond to those indicated on the operating hours counter.



ATTENTION: No smoking or open flames are allowed during servicing and repair work.

RISK OF FIRE!



ATTENTION: The operating pressure settings of the hydraulic system should only be set by trained qualified personnel. If malfunctions are caused by unauthorized alteration of operating pressure settings, all warranty responsibility on the part of the manufacturer is automatically forfeited.



NOTE: The hydraulic displacement pump must be bled after working on the hydraulic system, especially after using a vacuum pump. Starting the excavator without bleeding the the system can damage the pump. For the correct procedure, see 20.2.3.

Bleed the cylinders on the first or on subsequent installation as follows to avoid leaving air in the system that can damage components:

1. Extend the piston rod **slowly** and completely, do not apply any pressure at the end of the stroke.
2. Move the cylinder through at least 5 complete working cycles (extending/retracting) before using the excavator for normal work.

16.2 Maintenance Schedule

Servicing activity component	every 10 h (daily)	every 50 h (weekly)	every 250 h (6 months)	every 500 h (12 months)	every 1000 h (18 months)	annual
M O T O R						
Oil level	O					
Fuel level	O					
Leakage	O					
Visual check	O					
Air filter	O/X			<>		<>
Seating of mounting bolts		O				
Coolant	O					
Engine speed regulation			O			
Exhaust system			O			
Engine oil	O	<>(1)	<>			<>
Oil filter		<>(1)	<>			<>
V-belt: condition and tension		O				
Cooler fins		X				
Valve clearance		O			O	
Generator, starter					O	
Fuel tank					X	
Water pump					O	
Fuel filter		O	<>			<>
Cooling system and hoses				O		
Electrical connections				O		
Pre-glow system				O		
Coolant thermostat				O		
Battery fluid		O				

O - Check

Δ - Clean

◇ - Change/Replace

◇ (1) - Change/Replace the first time

Servicing activity component	every 10 h (daily)	every 50 h (weekly)	every 250 h (6 months)	every 500 h (12 months)	every 1000 h (18 months)	annual
HYDRAULIC SYSTEM						
Fastening bolts Hydraulic pump		O				
Leakage (lines, pumps, cylinders)		O				
Hydraulic oil level	O					
Oil cooler fins		X				
Filter insert		<>(1)	O	<>		<>
Primary and secondary pressure limiting valves				O		
Hydraulic oil			O	<>(1)	<>	<>
Breather filter Filling strainer					O	
ELECTRICAL						
Indicator lamps	O					
Function of system		O				
Fastenings			O			
TRAVELL GEAR						
Chain after working	O					
Chain tension		O				
Bearing play of tread rollers, track carrier rollers, front idlers		O				
TRAVEL GEAR UNIT						
Leakage		O				
Gear oil				<>(1)	<>	<>
GEARING						
Bearing system		O				
Gearing				<>		

O - Check
Δ - Clean

◇ - Change/Replace
◇ (1) - Change/Replace the first time

Servicing activity component	every 10 h (daily)	every 50 h (weekly)	every 250 h (6 months)	every 500 h (12 months)	every 1000 h (18 months)	annual
HEATING						
Function		○				
Leakage (cooling and heating circuit)		○				
Seals		○				
Fan		○				
WORKING EQUIPMENT						
Lubricate lubricating points	○	○				
Bucket teeth (fastening and wear)	○					
Pin fastening	○					
Line fastenings	○					
Piston rods	○					
Behaviour of hydraulic cylinder under load	○					
Bush bearing play					○	
Bearing play			○			
GENERAL						
Operating elements	○					
Hydraulic fittings	○					
Bolts	○					
Lights	○					
Windscreen washing system		○				
Leakage check - visual check	○					

○ - Check
 ▲ - Clean

◇ - Change/Replace
 ◇ (1) - Change/Replace the first time

17 Daily maintenance

17.1 General visual inspection and leak check

Also see the maintenance schedule 16.2

- * Check controls to ensure precision operation
- * Check hydraulic fittings
- * Pressure hoses, hose connections, and hydraulic cylinder seals for oil leaks
- * The radiator for water leaks
- * Engine for water and oil leaks
- * Battery connections
- * Check indicator lights (when starting the engine)

17.2 Engine

Check motor oil

Check the oil level using the dipstick. The vehicle must be horizontal and the engine off.

Check the quality of the oil as well. If the oil is very dirty, change the oil before the next maintenance interval.



NOTE: The marks on the dipstick indicate the minimum and maximum oil levels.

Top off engine oil if necessary by opening the cap and adding oil from a clean container.



ATTENTION: See the lubricant list for engine oil grade. Only use engine oil of the same quality.

Check coolant level



CAUTION: Check coolant level only when engine is cold.

Check coolant level in the reservoir.

Top off coolant if necessary. Turn the radiator cap counter-clockwise and remove.



ATTENTION: If coolant is added, ensure the water/antifreeze mixture is correct.

Check fuel filter with water separator

The container must be emptied if the indicator goes up (condensation).

Clean air filter

Open housing, clean dust trap.
Unscrew and remove filter.
Clean the filter using compressed air (3 - 5 bar).



ATTENTION: If the warning light on the instrument panel goes off, clean air filter immediately.
Important when working in dusty conditions.

Refuelling

After operation, always refill the fuel tank until it is full. This is to prevent the formation of water condensation in the interval between uses. Ensure that fuel is not spilt when refuelling.



ATTENTION: Make sure that you never run out of fuel, otherwise you must bleed fuel system.

17.3 Hydraulics

Check hydraulic oil level

Check the hydraulic-oil indicator in the main hydraulic valve unit.

Position of excavator arm while checking hydraulic oil levels:
Extend arm
Extend shovel bucket outward and lower it to the ground (piston rods in cylinders)
Turn off engine

Refill hydraulic oil as necessary. Open the cap and refill the hydraulic oil from a clean container.



CAUTION: Release residual pressure when working on the hydraulic sytem! The hydraulic oil quality can be checked on the list of lubricants. Always only use the same quality hydraulic oil.

17.4 Undercarriage and attachments

Tracks



ATTENTION: Check tracks immediately after operation!
Replace damaged tracks.

Check attachments (bucket, grab, etc.)

- Bucket teeth wear and tightness, pin tightness
- Line tightness, piston rod
- Behavior of the hydraulic cylinder when loaded

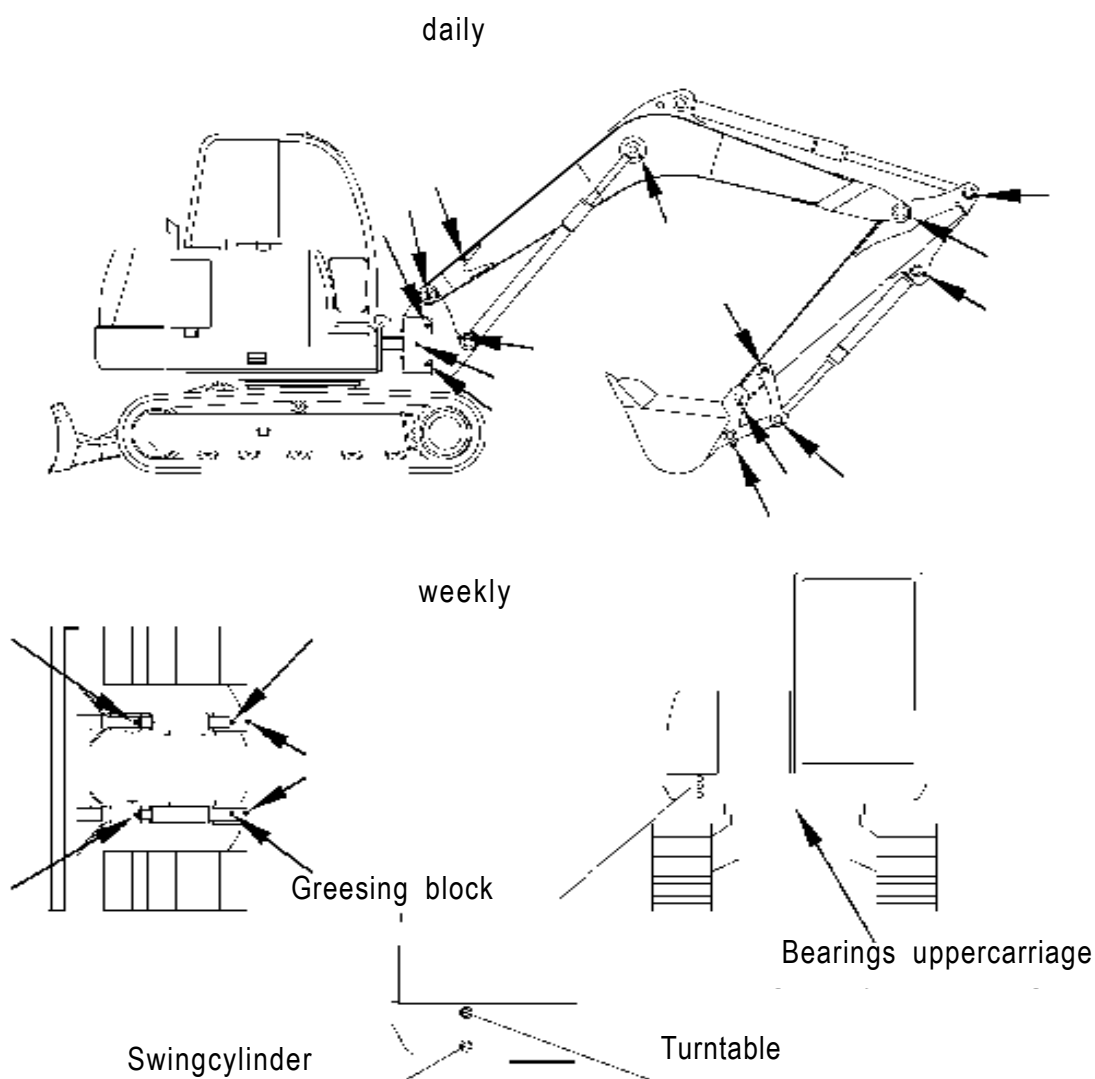


ATTENTION: Replace damaged or defective parts!

17.5 Lubrication points

Lubricate all other points daily (blue caps)

Lubricate the points marked W weekly (green caps)



18 Weekly maintenance or every 50 operating hours



NOTE:

In addition to normal daily maintenance, the following maintenance should be carried out weekly or every 50 operating hours, see maintenance schedule 16.2.

18.1 Engine

Check engine mounting

See engine operating instructions.

Check fan belt tension

See the engine operating instructions for how to check the belt tension. Replace the belt if cracks or other damage becomes evident.



ATTENTION:

Do not check with engine running.

Change oil and oil filter

See engine operating instructions.

The motor oil and oil filter must be changed after 50 operating hours. The schedule for further oil changes can be found in the engine operating instructions.

Dispose of used oil in accordance with environmental laws.

Battery

For battery maintenance follow the manufacturer's instructions.

Check battery fluid levels.

The battery is located on the left side of the engine compartment.

If it is necessary to replace the battery, dispose of the old battery in accordance with environmental laws.



NOTE:

The battery fluid levels must be between the min. and max. marks. Only add distilled water to battery fluid.

Check fuel filter with water separator

The container must be emptied if the indicator goes up (condensation).
Clean the sieve if it is dirty.

Clean radiator

Remove dirt, dust, leaves etc. from the slits in the radiator. Clean in shorter intervals when working in dusty conditions.
Check hoses and clamps and replace if necessary.

18.2 Hydraulics



ATTENTION: Always release residual pressure before working on the hydraulic system!

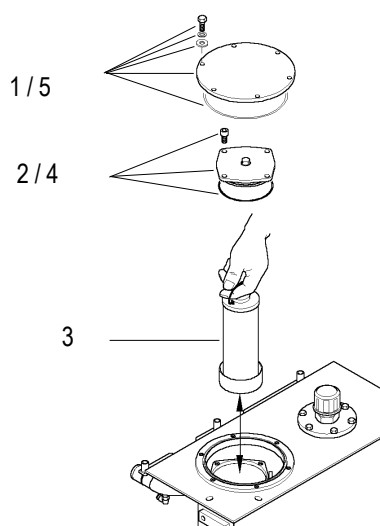
Hydraulic pump

Check tightness of screws and bolts.
Check the hydraulic system (lines, pumps, cylinder etc.) for leaks.

Clean hydraulic cooler

Remove dirt, dust, leaves etc. from the slits in the hydraulic cooler. Clean in shorter intervals when working in dusty conditions.

Change hydraulic oil filter (return filter)



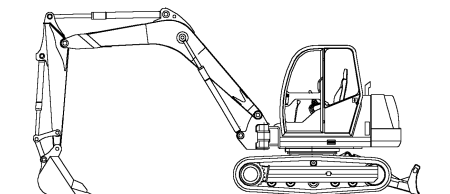
The return filter is to be changed for the first time after 50 operating hours.

- 1) Open the hydraulic oil tank carefully (tank is under pressure). Remove the screws (6).
- 2) Remove the screws from the return filter cover (4).
- 3) Replace return filter cartridge.
- 4) Put return filter cover back on and screw screws back in.
- 5) Close the hydraulic oil tank properly.
- 6) Let the crawler excavator idle in neutral for a few minutes.

Dispose of used filter in accordance with environmental laws.
See the operating instructions for other filter change intervals.

18.3 Undercarriage

Check track tension



Use the excavator arm and dozer blade to raise the excavator.

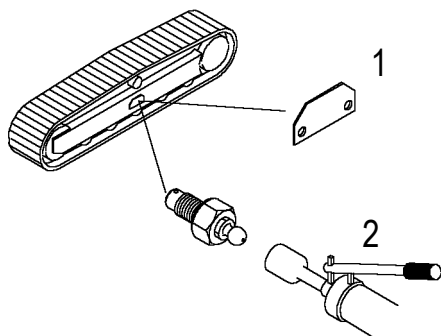
Tracks should no longer be touching the ground.

If necessary, use additional supports (make sure the excavator cannot overturn).

The track when taut should never be more than 15-20 mm from the rollers.

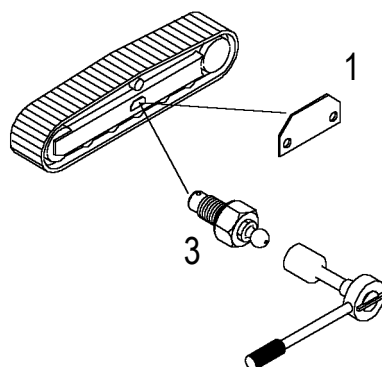


NOTE: If possible, the distance from the rollers should be the same for both tracks.



A) Increasing the track tension

- 1) Take off protective cover (1)
- 2) Tighten track using grease gun (2)



B) Decreasing the track tension

- 1) Take off protective cover (1)
- 2) Unscrew the return valve (SW 22) (3)
- 3) Allow grease to come out until pressure has been completely released.

Check the track rollers and wheels for play, also check track tension!

18.4 Traveling and swiveling drives

Check seals for leaks.

18.5 Turntable

Bearing system

Turn the superstructure slowly and lubricate both nipples in the lubrication block (see lubrication points 17.5).

Fresh grease should appear all around the edge of the seals.

18.6 Cab heating

- Check function
- Check cooling and heating circuit for leakage
- Seals
- Fan

18.7 Attachments

Lubricate attachments at lubrication points (see Lubrication Points 17.5)

18.8 Check windshield washer system

Add water to fluid container if necessary.

19 Maintenance every 250 operating hours



NOTE:

In addition to normal weekly maintenance and maintenance every 50 operating hours, the following maintenance should be carried out every 250 operating hours, see maintenance schedule 16.2.

19.1 Engine

See engine operating instructions for maintenance schedule.

Change oil and oil filter

See engine operating instructions.

Dispose of used oil in accordance with environmental laws.

Replace fuel filter

Dispose of used filter in accordance with environmental laws.

Check engine rpms and exhaust system

See engine operating instructions.

19.2 Hydraulics



ATTENTION:

Always release residual pressure before working on the hydraulic system!

Check hydraulic oil and filter

If it is necessary to replace the hydraulic filter, dispose of the used filter in accordance with environmental laws.

19.3 Electrical components

Check the cable harness and the battery. If necessary tighten and secure to avoid twisting.

19.4 Attachments

Check for play and replace damaged or defective parts!

20 Maintenance every 500 operating hours



NOTE: In addition to normal weekly maintenance and maintenance every 50 and 250 operating hours, the following maintenance should be carried out every 500 operating hours, see maintenance schedule 67.2.

20.1 Engine

See engine operating instructions for maintenance instructions.

Change air filter

Open cap, unscrew filter, replace filter. Clean dust trap.

Check valves

See engine operating instructions for the correct valve settings.

Check coolant system and hoses

Check electrical connections

Check glow plug

20.2 Hydraulics



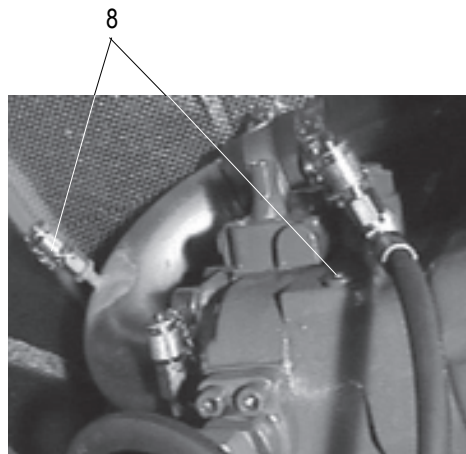
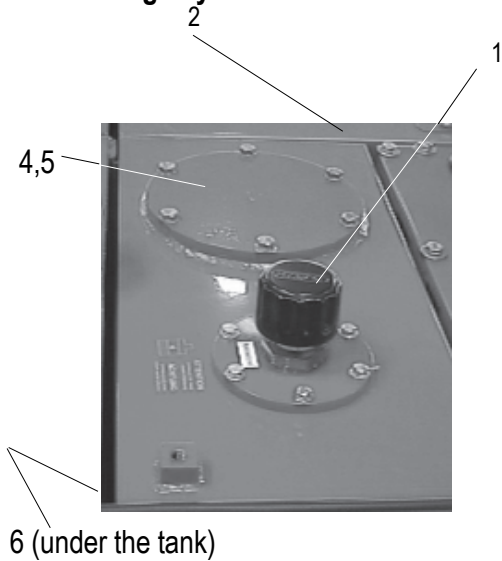
ATTENTION: Always release residual pressure before working on the hydraulic system!

Check primary valves

Adjust settings if necessary.

Change hydraulic oil filter (return filter)

Change hydraulic oil



The hydraulic oil should only be changed when warm (ca. 40 °C). Retract all hydraulic cylinders before changing the hydraulic oil. Rotate superstructure 90°.

- 1) Open ventilation filter (SW 36) to release pressure
- 2) Open the hydraulic oil tank carefully (tank is under pressure)
- 3) Drain oil into a container
- 4) Clean out the hydraulic tank if necessary (Remove cleaning cap)
- 5) Replace return filter cartridge (see 18.2.4)
- 6) Screw the drain plug back in properly
- 7) Refill with clean hydraulic oil (10 mμ) from a filling station
- 8) Open the hydraulic pump plug (hexagonal socket head screw, SW 6) until clear oil (without bubbles) comes out, close hydraulic pump plug
- 9) Close hydraulic tank
- 10) Let the excavator idle unloaded for a few minutes

Dispose of used hydraulic oil in accordance with environmental laws.

Check ventilation filter and sieve

Check ventilation filter and replace if necessary
Check sieve for damage and replace if necessary

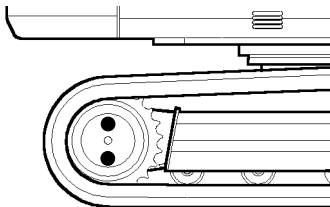
20.3 Gear rim

Change gear rim grease:

Remove cap under the gear, unscrew plug (2", SW 28 - square) with grease nipple, press out old grease by swiveling superstructure, screw plug back in, use the grease nipple to fill the gear rim with fresh grease, close cap.

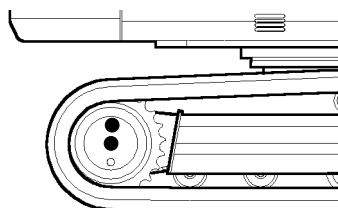
20.4 Traveling drive

Change drive oil



Change the drive oil on the outside of the drive unit

- 1) Put drive in the position shown
Open top and bottom screw plugs
Drain oil, collect in a container
Close bottom screw plug properly



- 2) With the drive in the position shown
Open middle screw plug
Refill with fresh oil in the top opening until it comes out of the middle opening
Close both openings properly



ATTENTION:

Dispose of used oil in accordance with environmental laws.

21 Maintenance every 1,000 operating hours



NOTE:

In addition to normal weekly maintenance and maintenance every 50, 250, and 500 operating hours, the following maintenance should be carried out every 1,000 operating hours, see maintenance schedule 16.2.

21.1 Engine

See engine operating instructions for maintenance instructions.

Check alternator and starter

Clean fuel tank

Replace fuel filter

Dispose of filter in accordance with environmental laws.

Check water pump

Change air filter

Change oil and oil filter

Dispose of used oil in accordance with environmental laws.

21.2 Hydraulics



ATTENTION:

Always release residual pressure before working on the hydraulic system!

Check hydraulic oil and filter

Check ventilation filter and sieve

Check ventilation filter and replace if necessary
Check sieve for damage and replace if necessary

21.3 Traveling and swiveling drives

21.3.1 Traveling drive - Change oil

21.4 Gear rim

Change gear rim grease (see 20.3)

21.5 Attachments

Check for play in bushings

Replace damaged or defective parts

Lubricate attachments at lubrication points (see 17.5)

22 Maintenance during longer periods of inactivity

22.1 Preparation for longer periods of inactivity

- Carefully clean and dry all parts



NOTE: When possible, do not leave the Crawler Excavator out in the open. If this is unavoidable, park the Crawler Excavator on wooden boards and cover it with a tarp.

- Lubricate all lubricated parts
- Change the motor oil
- Grease piston rods of the hydraulic cylinders
- Disconnect cables from battery or remove battery and store in a protected place
- Check antifreeze levels in coolant

22.2 Starting the excavator after periods of inactivity

- Wipe off grease from piston rods
- Reconnect or install battery
- Start engine and operate unloaded



ATTENTION: During longer periods of inactivity, the excavator should be operated unloaded once a month.

23 Lubricant table

Lubrication point	Lubricant
Motor oil	Q8 T660 10 W 40 API CH4, CE/SJ ACEA A3, B3, E3
Hydraulic oil	HVLP 46 Bio-Öl: Panolin HLP Synth 46 Fina Biohydran SE 46 BP Biohyd SE-46
Live ring	BP Energ grease MP-MG 2 BP Energ grease L 21 M
Gearing	
Ball bearing	
Travelling gear unit	Q8 T 55 SAE 85 W 90 Fina Pontonic GLS SAE 85 W 90
Excavator arm	BP Energ grease L 21 M
All lubrications points	BP Energ grease L 21 M

Range of application of motor oil:

from - 20 °C bis + 40 °C outdoor temperature

NOTE: All specified greases are suitable between - 25 °C to + 40 °C

24 Trouble shooting












Defect	Cause	Rectification
ENGINE		
Engine cannot be started	No fuel	Refuel
	Battery power insufficient	Charge battery, replace
	Fuel filter contaminated	Clean fuel filter
	Pre-glow system defective	Replace pre-glow system (service workshop)
	Fuel line leakage	Replace fuel line
Insufficient engine power	Air filter contaminated	Clean air filter
	Engine not at operating temperature	Warm up engine
	Engine overheated	Check cooling system
INDICATOR LAMPS		
Engine oil pressure indicator lamp comes on during operation	Oil pressure too low	Stop engine immediately, check oil level and top up if necessary
	Check oil level	If oil level is correct, oil pump is defective (service workshop)
Temperature display rises above 100 °C	Oil level too low	Top up oil
	Cooling water level too low	Top up coolant
	Fan blades rotate too slowly	Re-tension V-belt
	Air filter contaminated	Clean air filter
Charge monitor lamp comes on during operation	Generator not charging properly	Re-tension V-belt
Fuel display illuminated	Insufficient fuel	Refuel

Defect	Cause	Rectification
WORKING EQUIPMENT		
Slewing chassis is difficult or impossible	Brakes do not release	Authorized workshop
	Insufficient lubrication	Lubricate slewing ring hose connections
	Slewing motor defective	Authorized workshop
Equipment does not work, or only at low working/grab performance	Insufficient hydraulic oil	Top up hydraulic oil
	Hydraulic oil not warm	Warm up the engine
	Insufficient engine power	See engine
	Coupling or pump damaged	Authorized workshop
	Pressure limiting valves set too low	Authorized workshop
	Hydraulic cylinder damaged	Authorized workshop
	Control valves damaged	Authorized workshop
Cylinders lower too quickly	Seals contaminated or defective	Authorized workshop
	Heavy leakage at control spools	Authorized workshop
	Secondary cartridges defective	Authorized workshop
Hydraulic lines overheat	Hydraulic oil filter blocked	Clean or change filter
	Insufficient hydraulic oil in oil reservoir	Top up hydraulic oil
	Secondary cartridges set too low	Authorized workshop
	Cooling system not in working order	Clean oil cooler

Defect	Cause	Rectification
SEALS+HOSES		
Oil or fuel leakage below the engine	Loose hose connections Sealings and/or hoses damaged	Tighten hose connection Change sealings and/or hoses and check and refill oil level, if necessary
Oil loss in hydraulic system	Loose hose fittings sealings, hoses, or piping damaged	Tighten hose fittings, check hydraulic oil level, top up if necessary Change sealings, hoses, piping (service workshop)
TRAVELLING GEAR		
Travel not possible	Foreign body jammed Gears defective	Remove foreign body Authorized workshop
Travel straight-ahead not possible	Foreign body jammed Differing chain tension Travel valves damaged	Remove foreign body Tension chains equally Authorized workshop

27 Lifting capacity

HUBKRAFTTABELLE

		6,0m	5,0m	4,0m	3,0m
A					
B					
4,0m	1795*	790		1825*	2270*
3,0m	1800*	670	1890*	2175*	2225
2,0m	1830*	600	2100*	2625*	2080
1,0m	1875*	575	2295*	3050*	1975
0,0m	1930*	580	2445*	3320*	1800
-1,0m	1980*	630	2400*	3300*	1655
-2,0m	2020*	775		2850*	1575
-3,0m	1950*	1125			

max. Zulässige Last bei gestrecktem Löffelstiel

A Ausladung von Mitte Drehkranz

B Lasthakenhöhe

* Hubkraft durch Hydraulik begrenzt

Alle Tabellenwerte sind in kg angegeben, bei waagrechter Stellung auf festem Untergrund und ohne Löffel

- mit Planierschildabstützung in Fahrtrichtung

..... mit Planierschildabstützung in Planfrichtung
..... ohne Planierschildabstützung 90° zur Fahrfrichtung

Sofern ein Löffel oder sonstige Arbeitsgeräte angebaut sind, verringert sich die Hubkraft oder Kipplast um deren Eigengewicht.

Berechnungsgrundlage: gem. ISO 10567

Die Hubkraft des Kompaktbaggers ist

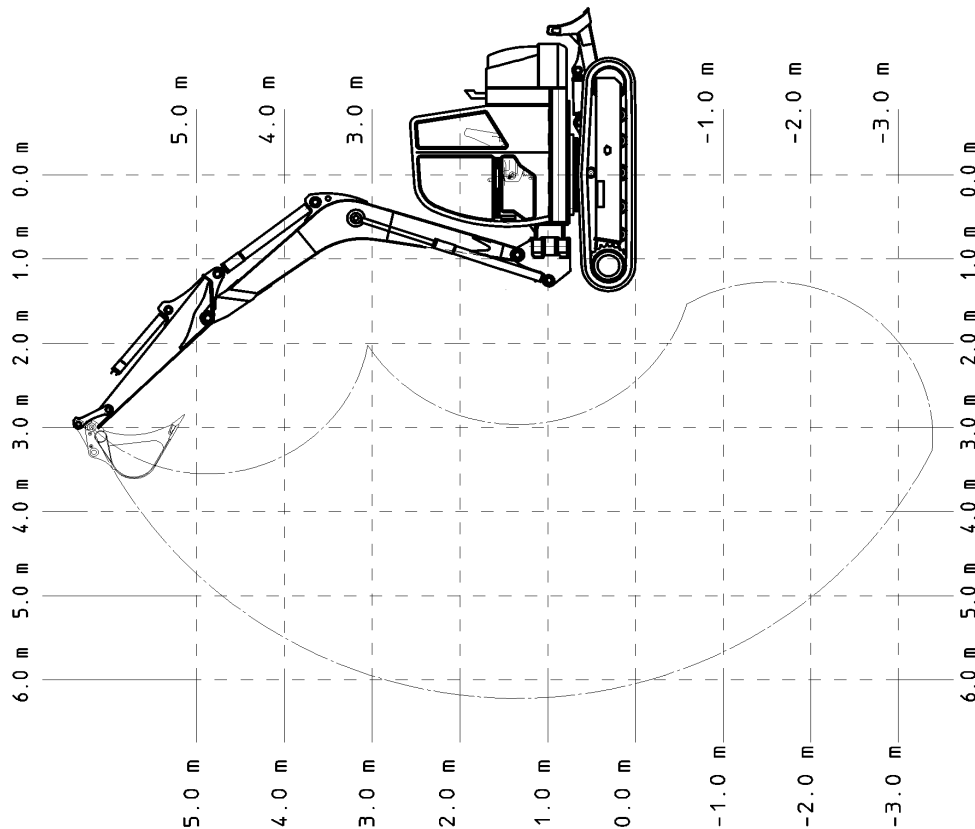
Die Hubkraft des Kompaktaggers ist durch die Einstellung der Überdruckventile

und durch die Kippsicherheit begrenzt.

Es werden weder 75 Prozent der statischen

Es werden weder 75 Prozent der statischen Kipplast noch 87 Prozent der hydraulischen

Kipplast hoch 67 Prozent
Hubkraft überschritten.



Diese Zeichnung ist urheberrechtlich geschützt und darf ohne unsere schriftliche Genehmigung weder kopiert noch weiterverbreitet werden. Die Weitergabe oder die Vervielfältigung dieser Zeichnung für andere Zwecke als die, die hier angegeben sind, ist ausdrücklich untersagt. Die Nachahmung der Zeichnung ist strafbar und verpflichtet zu Schadensersatz.

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HUBKRAFTTABELLE

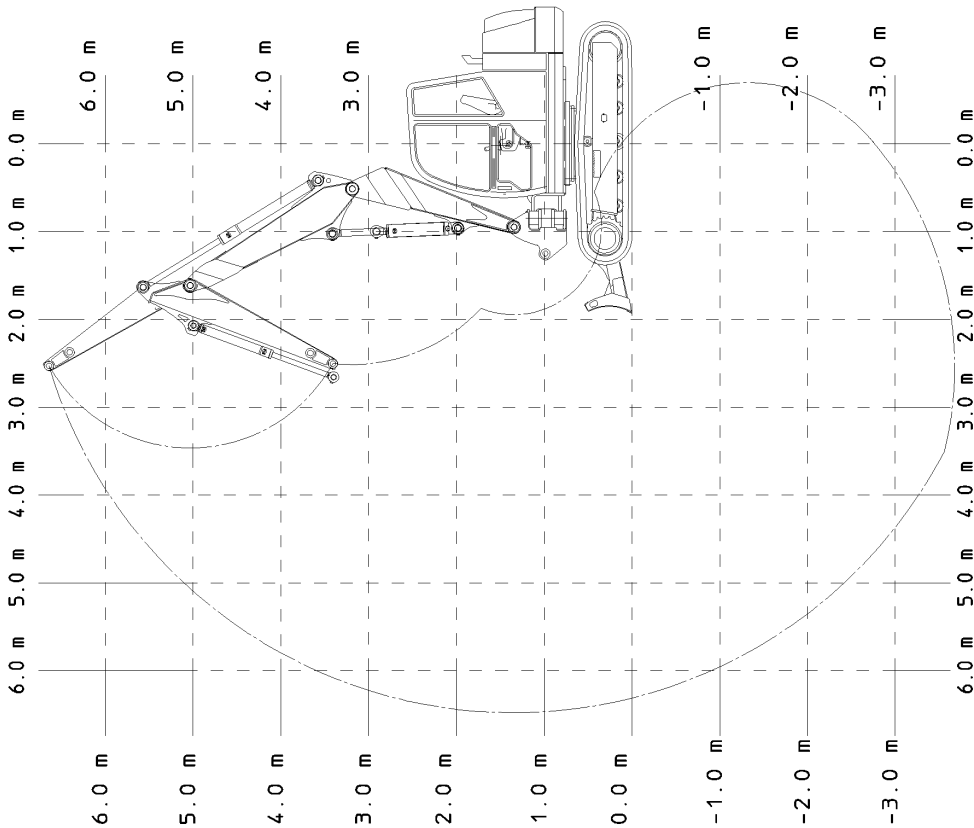
			6,0m	5,0m	4,0m	3,0m
A	B					
4,0m	1700*	700			1820*	2270*
3,0m	1690*	560			2175*	2875*
2,0m	1700*	500	1755*	1700*	2525*	3550*
1,0m	1740*	460	1840*	2030*	2900*	4160*
0,0m	1775*	455	1850*	2225*	3140*	4510*
-1,0m	1805*	500		2345*	3125*	4455*
-2,0m	1830*	600		2270*	2725*	3850*
-3,0m	1860*	875				1375

max. Zulässige Last bei gestrecktem Löffelstiel
A Ausladung von Mitte Drehkranz
B Lasthakenhöhe
* Hubkraft durch Hydraulik begrenzt

Alle Tabellenwerte sind in kg angegeben, bei waagrecht
Stellung auf festem Untergrund und ohne Löffel.
..... mit Planierschildabstützung in Fahrtrichtung
..... ohne Planierschildabstützung 90° zur Fahrtrichtung

Sofern ein Löffel oder sonstige Arbeitsgeräte angebaut sind,
verringert sich die Hubkraft oder Kipplast um deren Eigengewicht.

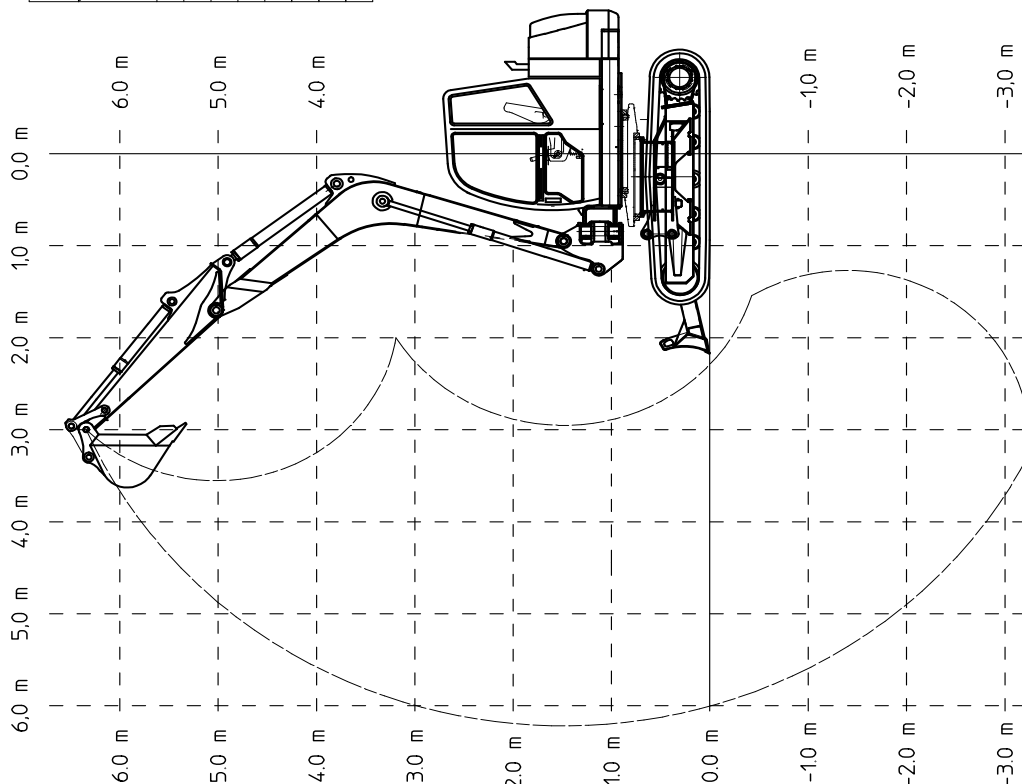
Berechnungsgrundlage: gem. ISO 10567
Die Hubkraft des Kompaktbaggers ist
durch die Einstellung der Überdruckventile
und durch die Kippsicherheit begrenzt.
Es werden weder 75 Prozent der statischen
Kipplast noch 87 Prozent der hydraulischen
Hubkraft überschritten.



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Personen mitgeteilt oder zugänglich gemacht werden. Widerrechtliche Benutzung ist strafbar und verpflichtet zu Schadenersatz.

		Fläche (mm²)	Gewicht (kg)	Werkstoff
		Breite (mm)	Kantung (mm)	
		BAGGER 8002 RD		
		HUBTABELLE		
		KNICKARM		
		ZUG-Nr. 701105		
		KRAFT ZUG		

HUBKRAFTTABELLE

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max. Zulässige Last bei gestrecktem Löffelstiel

max. zulässige Last bei gestrecktem
A Ausladung von Mitte Drehkranz

B Lasthakenhöhe

* Hubkraft durch Hydraulik begrenzt

Alle Tabellenwerte sind in kg angegeben, bei waagrechter Stellung auf festem Untergrund und ohne Löffel

	.....	mit Planierschildabstützung in Fahrtrichtung
	.....	ohne Planierschildabstützung, 90° zur Fahrtrichtung
	.....	Überwagen mittels Option VAR10 nach hinten verschoben
	.....	ohne Planierschildabstützung, 90° zur Fahrtrichtung
	.....	Überwagen mittels Option VAR10 nach vorne verschoben

Sofern ein Löffel oder sonstige Arbeitsgeräte angebaut sind, verringert sich die Hubkraft oder Kipplast um deren Eigengewicht. Stellung auf festem Untergrund und ohne Löffel.


Berechnungsgrundlage: gem. ISO 10567

Die Hubkraft des Kompaktbagers ist durch die Einstellung der Überdruckventile und durch die Kippsicherheit begrenzt.

Es werden weder 75 Prozent der statischen Kipplast noch

Es weicht weder 73 Prozent der statischen Kippkraft noch 87 Prozent der hydraulischen Hubkraft überschritten.

ACHTUNG, das Vario System weicht in einigen Baggerpositionen von der ISO 10567 ab. Abweichend von der ISO 10567 wird das Überschreiten der Kipplast mittels einer Warneinrichtung signalisiert.

		Früchte (max. 3)		Gewicht (kg)	Werkst.	Mollisab
		Rechtlich (max.)		Von (datum)		
				Label	Maße	BAGGER 0002 VARIO HUBTELLE VARIO
				Rechtlich (max.)	FF	
				Maße		
						Bohr
						ZG - Nr.: 701114
						Erstellt: lue
						Bohr
						ZG - Nr.: 701114
						Erstellt: lue
						Bohr
						ZG - Nr.: 701114
						Erstellt: lue
						Bohr
						ZG - Nr.: 701114
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						Erstellt: lue
						Bohr
						ZG - Nr.: 701114
						Erstellt: lue

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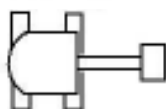
27.2 Legend of Lifting Power Tables

- max** admissible load with dipper stick straight
A projection from live ring centre
B height of lifting hook
***** lifting power limited by hydraulic system

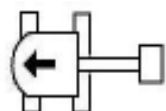
All values of the table are specified in kg, in horizontal position on solid subsoil and without bucket.



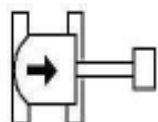
.... with dozer blade supported, in travelling direction



... without dozer blade supported, 90° to travelling direction



... without dozer blade supported, 90° to travelling direction
superstructure shifted backward by means of option VARIO



... without dozer blade supported, 90° to travelling direction
superstructure shifted forward by means of option VARIO

If a bucket or other working facilities are installed, the lifting power or tilting load is reduced by the empty weight of such facilities.
Position on solid subsoil and without bucket.

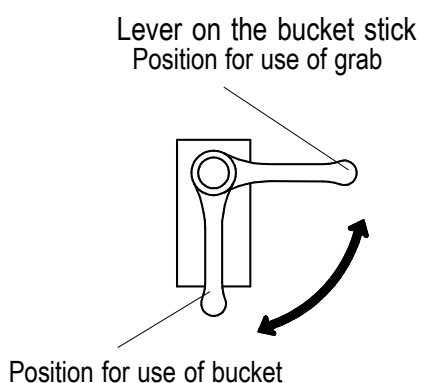
Design fundamentals: acc. to ISO 10567

The lifting power of the compact excavator is limited by the setting of the pressure control valves and the stabilizer system. Neither 75% of the static tilting load nor 87% of the hydraulic lifting power are exceeded.

WARNING! The Vario system deviates from ISO 10567 in some excavator positions. Other than specified by standard ISO 10567 any exceeding of the tilting load is announced by means of a warning device.

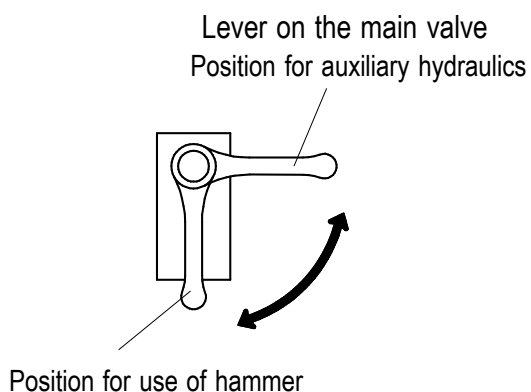
28 Option

28.1 Hydraulic connections for additional attachments



Hydraulic connections for supplying additional attachments are located at the end of the bucket sticket.

The hydraulics supply for additional attachments can be activated by turning the levers on the bucket stick and in the main hydraulic valve area.



28.2 Additional hydraulics actuated electrically

At this function the control of the additional hydraulics is shifted from the foot pedal to the joystick. By this function the operation of the built-on tool is considerably simplified for the excavator driver.

The following items must be observed by all means:

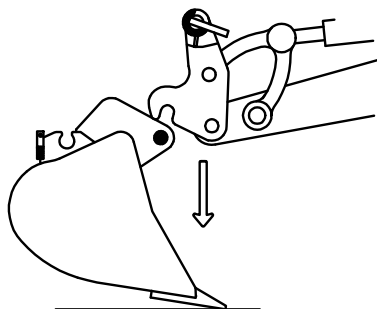
1. At this option the function Additional hydraulics "Black / White" is switched, i.e. a fine control like with the foot pedal is not possible.
2. When this option is used for the employment of swivelling shovels (e.g.: at earth levelling work), jerky movements of the lifting arm or shovel arm can arise.

28.3 Quick change mechanism

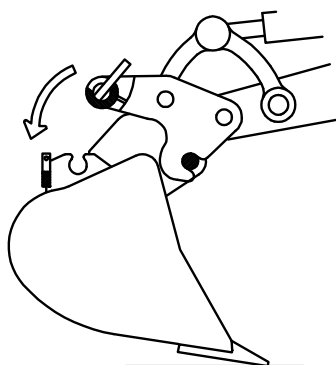
ATTENTION: In order to change attachments, the excavator **MUST** always be in a depressurized state.

Assembly Note:

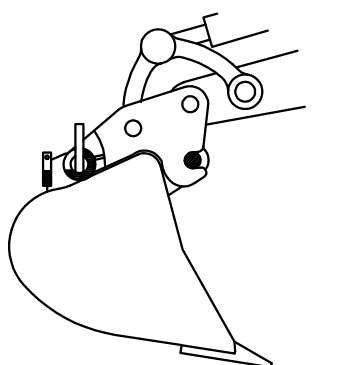
1. Lower boom and bucket stick until they lock around bolt.



2. Engage the clamping device.

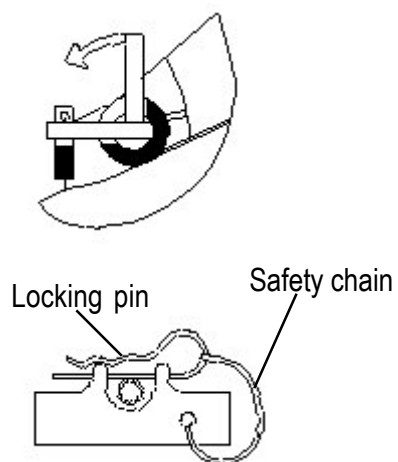


3. Lock the quick change mechanism into place.



ATTENTION: Allow lever to lock into place and then secure with a locking pin!

4. Ensure that locking device cannot accidentally release!

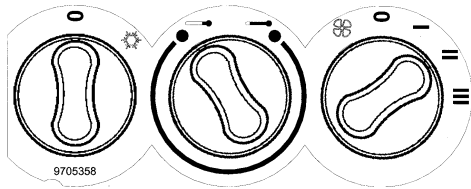


CAUTION: The stability of the excavator can be affected by changing attachments (**risk of overturning!**).

28.4 Air conditioning unit

Actuation equipment

Function



The first actuation equipment serves to switch the air conditioning function on and/or off.

The next actuation equipment is for the cold/warm setting. The third actuation equipment is the blower. At the blower three settings are possible. These settings only determine the strength.

The grid for the air conditioning unit is in the foot area of the seat, which can be opened manually as well as can be closed again when required.



HINT: In order to have an optimum cooling capacity, all windows and doors must be closed.

ATTENTION:

Grid closed = air conditioning function interrupted

Grid open = air conditioning function ready for operation

28.5 Diesel pump

The diesel pump is located on the hydraulic tank under the valve cover.



NOTE:

The diesel pump must be turned off immediately after filling up the excavator, otherwise defects may occur.

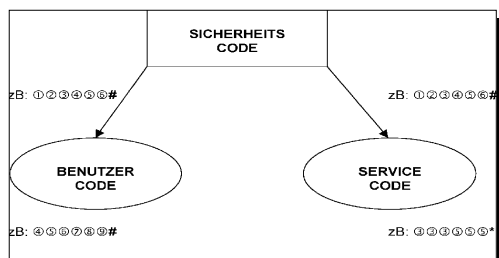
28.5 Theft Protection

As soon as the device is switched on the green LED starts flashing slowly, thus indicating that the system is in the secured mode.

Upon delivery of the device you receive a certificate with the system number and the safety code.

If the device is in the secured mode, you can enter two safety codes, the **service code** and the **user code**.

1. Make sure that the LED lights up red each time you press a key.
2. Slowly enter the 6-digit **safety code** followed by the # key. The green LED starts flashing quickly.
3. Now you've got 30 sec to enter the **service code** or the **user code**.
4. Slowly enter the desired 6-digit **user code** followed by the # key.



Slowly enter the desired 6-digit **service code** followed by the * key.

After each sequence the green LED goes out and lights up again - flashing slowly. Now you have defined your codes and the system returns to the safety mode.

To start the machine you must enter the service code or the user code followed by the # key.

Standby mode: After entering the user code the green LED goes out. Now you have got 30 sec to start the device. After 30 sec the system returns to the safety mode.

Safety mode: If you shut down the device, the system will change to the safety mode after 12 sec - green LED flashing slowly. Another starting attempt is possible only within this period of 12 sec.

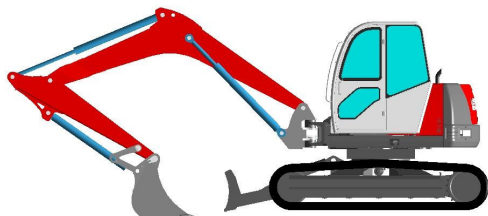
Starting sequence:

1. Switch on ignition
2. Enter user code
3. Switch off ignition
4. Start within 30 sec

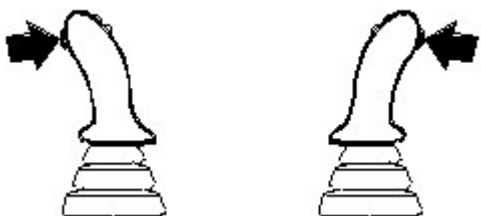
28.8 NEUSON VARIO

Operation of Neuson Vario

To change the eccentric position, the following steps must be absolutely observed.

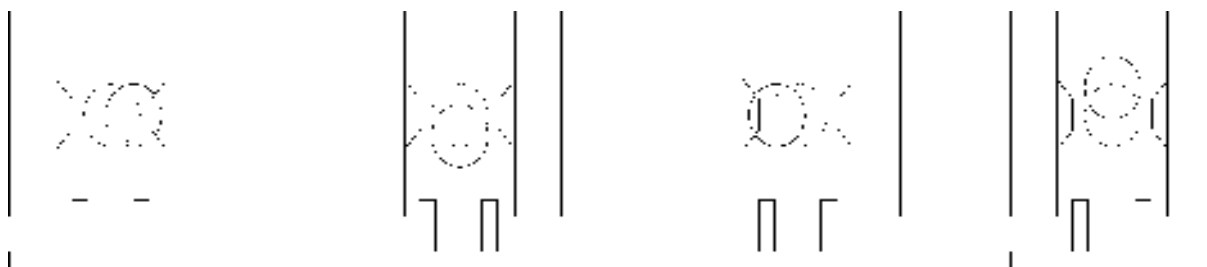


1. The dipper stick must be supported on the ground.



2. To open the lock of Neuson Vario both front switches at the left and the right joystick must be pushed and kept pressed.

At Neuson Vario there are four locking positions, each offset by 90° (0°/360°, 90°, 180°, 270°).



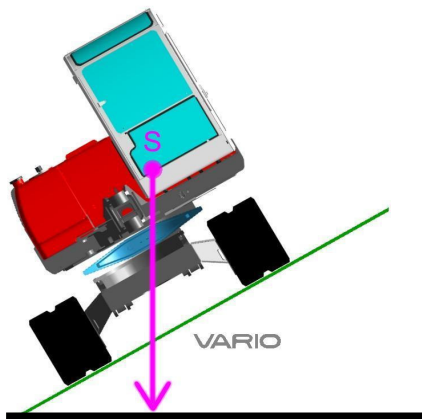
To reach the correct position the left joystick must be pushed left or right.

After the excavator has moved the two buttons may be released. After turning by 90° the Neuson Vario engages automatically.

If the Neuson Vario shall be offset by more than 90°, the buttons at the joystick must be kept pressed beyond the 90° offset.

As soon as the buttons are released, the Neuson Vario engages at the next possible lock.

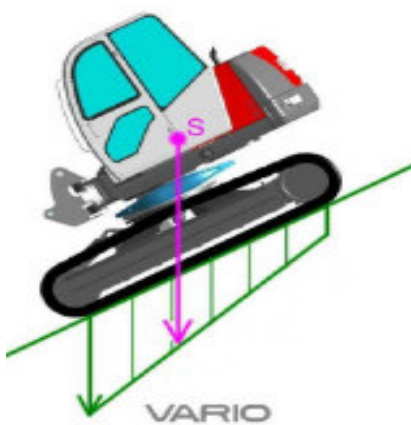
Driving the Neuson Vario Transverse to the Slope



To achieve a better stability when driving transverse to the slope the excavator should be shifted towards the slope.



WARNING: For reasons of safety only the eccentric position indicated above may be chosen for driving transverse to the slope.



To achieve a better climbing ability when driving uphill, the centre of gravity of the Neuson Vario shall be shifted towards the slope .

Warning Equipment of Neuson Vario

1) Depending on the position of the Vario stability might be increased or reduced (warning range A) compared with the standard excavator. Please confer the Lifting Power Table and the figure "Warning range".

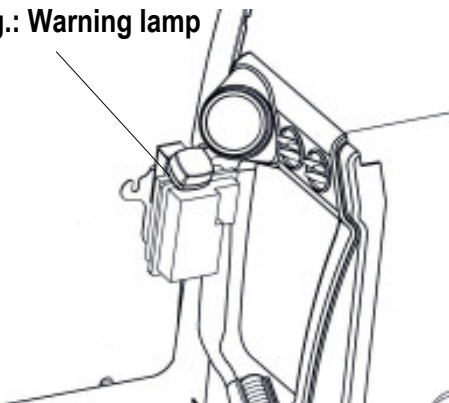
Explanation of warning ranges:

A (digging above crawler).....WARNING, reduced stability!

B (digging in longitudinal direction).....

superstructure in the unfavourable range compared with Vario, no change of stability (hydraulically limited)

Fig.: Warning lamp



2) The warning device is set to 73% of the static tilting load in case of unfavourable superstructure position. As soon as this load is exceeded and working is done with the superstructure in an unfavourable position (warning range) or when slewing into such range, a short warning sound is emitted once and a warning lamp lights up (for position of warning lamp see figure "Warning lamp").

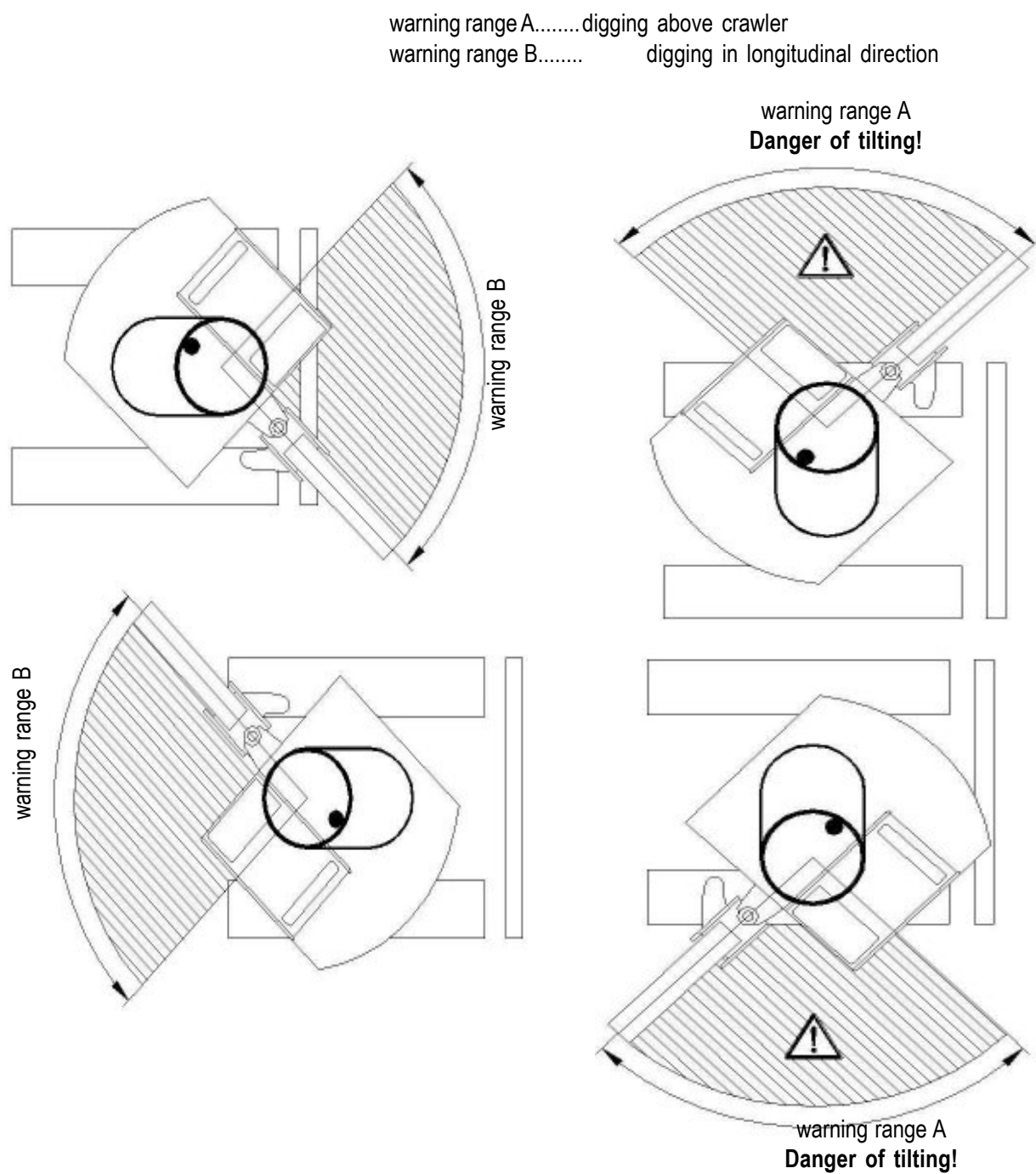
3) WARNING: If the stick system is not lowered and slewed out of the danger area when the warning (sound, lamp) is emitted (braking of superstructure and opposite control), or if the warning is ignored, the machine may tilt!

4) The warning lamp is equipped with a function check. Upon each start the lamp lights up for a short time.

Always make sure that the warning lamp is working properly!

Operation of the excavator is permitted only with the lamp being functioning properly!

Figure: Warning range

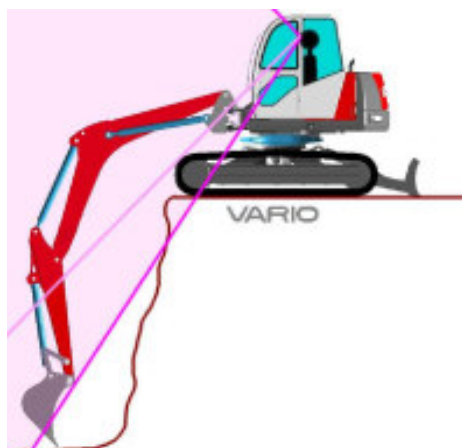


WARNING: This safety device must be checked upon each service (every 250 op. hours) by authorized personnel.

This warning device must not be bypassed or rendered ineffective.

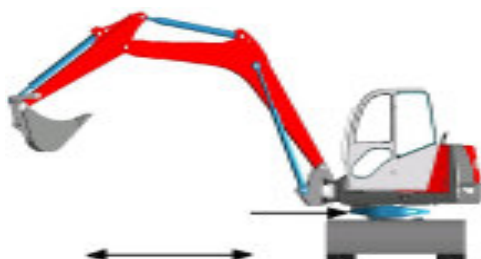
!!! DANGER TO LIFE !!!

Working with Neuson Vario



When excavating a pit, the superstructure can be slewed to the side of the dozer blade. Thus a higher stability is achieved for digging on the side opposite the blade, at the same time providing free visibility to the pit.

Increased Working Range of Neuson Vario



The working range of Neuson Vario can be increased by 250 mm.



By shifting the superstructure to the side opposite the blade the bucket can be moved right up to the blade.

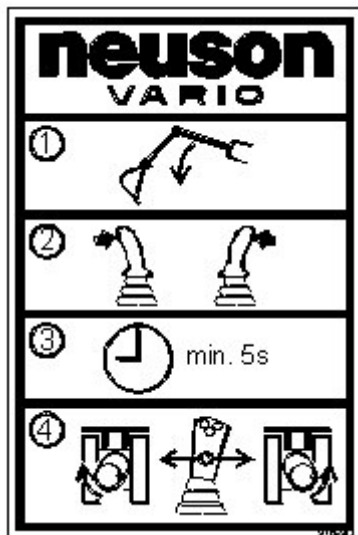
Neuson Vario Labels



Operation of Neuson Vario

- “ Make sure to read and observe the operating instructions.
- “ Support dipper stick on the ground.

In case of non-compliance persons and/or the machine driver may be endangered, the machine may tilt or other danger may occur.



Shifting of Neuson Vario

1. Dipper stick must be supported on the ground.
2. The indicated buttons at the two joysticks must be pressed.
3. Wait for at least 5 sec with buttons pressed.
4. Now the Neuson Vario can be shifted by means of the left joystick.



WARNING: The sense of rotation of Neuson Vario is opposite to the normal sense of rotation.

Lubrication Points at Neuson Vario

There is another lubrication nipple on the top side of the eccentric disk



A Safety instructions for the operation of earth-moving machinery

1 Preface

The following are designated as earthmoving machinery:

- excavators,
- loaders,
- excavator-loaders,
- bulldozers,
- dump trucks,
- scrapers,
- graders,
- pipe-laying machines,
- trench cutting machines,
- compactors and
- special-purpose earthmoving machines.

Instructions on the safe operation of earthmoving machinery are given below.

When operating and servicing earthmoving machinery, the respective national safety instructions, e.g. in the Federal Republic of Germany the accident prevention regulations for earthmoving machinery (VBG 40), vehicles (VBG 12) and the safety regulations for vehicle maintenance (ZH 1/454), must also be observed.

As a supplement to the operating instructions, the statutory regulations for public road transport and for accident prevention must be observed. Such regulations may, for example, also relate to the handling of hazardous substances or the wearing of personal protective gear.

In addition, existing safety requirements must also be observed for special locations (tunnels, galleries, quarries, pontoons, contaminated areas etc.).

2 Intended use

- 2.1 Earthmoving machinery must be operated only under the intended operating conditions provided by the manufacturer in the operating instructions.
- 2.2 The use is as intended when the earthmoving machine is used with the corresponding operating devices in accordance with the European or national safety regulations or for other work for which it is suitable according to the manufacturer's instructions.
- 2.3 Changes to the safety systems of the earthmoving machine by the owner without the prior consent of the manufacturer are inadmissible.

2.4 Spare parts must comply with the technical requirements specified by the manufacturer.

3 General information

3.1 Earthmoving machinery must be operated or serviced independently only by persons

- who are physically and mentally suited,
- who are instructed in the operation or servicing of the earthmoving machine and have furnished proof of their capacity to do so to the contractor,
- and who can be expected to perform the tasks assigned to them reliably.

The statutory minimum age must be observed.

3.2 Any working method prejudicial to safety must be avoided.

3.3 The legal load of earthmoving machinery must not be exceeded.

3.4 The earthmoving machine must be operated only in a safe, serviceable state.

3.5 The operating instructions issued by the manufacturer must be observed for operation, servicing, repair, assembling and transport.

3.6 The contractor must supplement safety regulations where necessary with special instructions adapted to local operating conditions.

3.7 Operating instructions and safety-relevant instructions must be in safekeeping by the operator's seat. In the case of earthmoving machinery without cabs, they may be kept at the application site.

3.8 The operating instructions and the safety instructions must be present in full and in a legible state.

3.9 Safety devices on earthmoving machinery must not be disabled during machine operation.

3.10 Protective working gear must be worn during machine operation. Rings, scarves and open jackets must be avoided. Goggles, safety footwear, safety helmets, protective gloves, reflective waistcoats, ear plugs etc. may be needed for specific operations.

3.11 Prior to beginning work, information on first aid and on emergency services (ambulance, fire service, helicopter) is essential.

It must be checked that a first-aid kit complying with the regulations is present.

3.12 The location and operation of fire extinguishers on the earthmoving machine and the local fire-alarm and fire-fighting facilities must be known.

- 3.13 Loose parts, e.g. tools or other accessories, must be secured on the earthmoving machine.
- 3.14 Doors, windows, covers, flaps etc. must be secured against inadvertent closing when in opened state.
- 4 Hazard zone
 - 4.1 All persons must keep out of the hazard zone of earthmoving machinery.

The hazard zone is the surrounding area of the earthmoving machine in which persons may be reached by operation-induced movements of the earthmoving machine, its operating devices and its attachments or by swinging-out loads, by falling material or by falling operating devices.
 - 4.2 The machine operator may work with the earthmoving machine only if no person is within the hazard zone.
 - 4.3 The machine operator must give a warning signal if persons are exposed to danger.
 - 4.4 The machine operator must stop working with the earthmoving machine if persons fail to leave the hazard zone despite a warning.
 - 4.5 No person may have access to the pivot range of earthmoving machinery with centre pivot steering when the engine is running.
 - 4.6 An adequate safety clearance (min. 500 mm) must be kept from fixed components, e.g. structures, quarry faces, scaffolding or other machines, to prevent the risk of crushing.
 - 4.7 If the safety clearance cannot be observed, the area between fixed components and the operating range of the earthmoving machine must be closed off.
 - 4.8 If the machine operator has a restricted view of his driving and operating area due to deployment-induced influences, he must be assisted by a marshaller or the driving and operating area must be secured by a fixed barrier.
- 5 Stability
 - 5.1 Earthmoving machinery must be used, driven and operated in such a way that its stability or its security against overturning is guaranteed.
 - 5.2 The machine operator must adapt the travelling speed to local conditions and keep the operating device as close as possible to the ground when driving over sloping or uneven terrain.
 - 5.3 In the case of earthmoving machinery fitted with additional stabilising devices to increase stability, the manufacturer's operating instructions must be observed.

- 5.4 Earthmoving machinery must be kept sufficiently far away from the edge of quarries, trenches, stockpiles and slopes to prevent any risk of overturning.
- 5.5 Earthmoving machinery must be secured against inadvertent movement or slippage when working close to the edges of excavations, shafts, ditches, trenches and slopes.

6 Operation

6.1 General

- 6.1.1 Machine operators must be appointed by the contractor to operate or service the earthmoving machine.
- 6.1.2 Operating devices (adjusting components) may be activated only by the operator or from the operator's console.
- 6.1.3 The steps and areas provided must be used for access to the machine. They must be kept in a non-slip state.
- 6.1.4 For earthmoving machinery fitted with quick-change devices for mounting and discharging the operating device, of which locking mechanism is not clearly visible from the operator's workplace (design, soiling), the following additional safety measures are essential:
- The firm fit of the operating device at the connection of the quick-change device must be controlled directly by the operator or another person.
 - If this is not feasible, the operating device must be lifted only to such an extent that the firm fit can be checked by rearward tilting and dumping.

All persons must keep out of the hazard zone during this test run.

6.2 Transport of persons

- 6.2.1 Apart from the machine operator, no persons may be transported on earthmoving machinery unless special places have been provided for this purpose by the manufacturer.

These special places must be equipped with fixed seats and securing devices to prevent persons from falling from the earthmoving machine.

- 6.2.2 No one may mount or alight from earthmoving machinery except with the prior consent of the machine operator and when the machine is stationary.

6.3 Driving

- 6.3.1 Prior to starting up the earthmoving machine, the operator's seat, the mirror and the adjustable parts must be set in such a way as to ensure operational safety.
- 6.3.2 The safety belt must be applied when earthmoving machinery is fitted with a ROPS system or a TOP protective structure.
- 6.3.3 The windows must be clean, and free from condensation and ice.
- 6.3.4 Cold-start aids (ether) must not be used near sources of heat or open flames or on poorly ventilated premises.
- 6.3.5 The roadways must be designed so as to ensure smooth, safe operation, i.e. they must be adequately wide with the lowest possible gradient and laid on a base with a good bearing capacity.
- 6.3.6 The bearing capacity of bridges, basement ceilings, vaulting etc. must be checked before driving over them.
- 6.3.7 The clearance dimensions of underpasses, tunnels etc. must be checked prior to driving into them.
- 6.3.8 On high gradients and slopes, the load must be kept towards the incline if possible to increase stability.
- 6.3.9 The engine must not be out of gear when driving downhill. Prior to driving down the slope, the gear suited to the terrain must be selected and no gear change made while driving downhill.
- 6.3.10 Slopes on driveways must be designed to ensure that earthmoving machinery can be safely braked.
- 6.3.11 Extensive reversing should be avoided.
- 6.3.12 Earthmoving machinery must not be driven on the public highway unless an operating and driving licence compatible with the national traffic legislation is available.
- 6.3.13 Outside the public transport area, e.g. on construction sites, traffic regulations should be applied analogously. This point should also be taken into account there with respect to the driving licence.

6.4 Loading, unloading

- 6.4.1 The machine operator must not swing the operating devices across occupied driving, operating and working places of other machines unless they are secured with fall-over protective structures (FOPS).
- 6.4.2 If the required protection above the driver's cab is not present, the driver of that vehicle must leave the driver's stand when swinging across it is necessary.
- 6.4.3 The vehicles must be loaded in such a way that they are not overloaded and cannot lose any material while being driven. They must be loaded from the lowest possible height.
- 6.4.4 The unloading locations must be designed to ensure that extensive reversing is avoided as fast as possible.
- 6.4.5 Earthmoving machinery must not be operated at dumping sites unless appropriate measures have been taken to prevent inadvertent movement or overturning.
- 6.5 Marshallers
 - 6.5.1 Marshallers must be clearly recognisable, e.g. through special clothing. They must be within the visual range of the machine operator.
 - 6.5.2 During their marshalling activity, marshallers must not be given other tasks which might distract them from their functions.
- 6.6 Deployment with risk of falling objects
 - 6.6.1 When there is a risk of heavy objects falling, earthmoving machines must not be used unless their operator's stand is fitted with a protective roof (FOPS); in the case of excavators a protective windscreen (FGPS) must also be present.
 - 6.6.2 Close to earth and rock walls, excavators should be set up and operated in such a way that the operator's stand and the steps leading to it are on the side of the earthmoving machine away from the wall.
 - 6.6.3 Demolition work must not be done with earthmoving machinery unless it is assured that persons are not at risk.
 - 6.6.4 Prior to carrying out demolition work with excavators, e.g. demolishing with demolition pendulums, the weight of the pendulum must be coordinated with the load capacity of the machine and the boom length.
 - 6.6.5 The highest point of the operating device of the earthmoving machine should be above the component to be demolished.

6.7 Operation in areas carrying underground lines

- 6.7.1 Prior to carrying out excavation work with earthmoving machinery, a check must be made in the area to be excavated for underground lines which might present a risk to persons.
- 6.7.2 If underground lines are present, their location and course must be determined by agreement with the owner or operator of the line and the necessary safety measures must be stipulated and taken.
- 6.7.3 The course of lines in the construction site zone must be clearly marked under supervision prior to earthmoving work being commenced. If the location of lines cannot be determined, exploratory trenches must be dug, if necessary by hand.
- 6.7.4 If underground lines or their protective coverings are contacted or damaged inadvertently, the machine operator must stop work immediately and notify the supervisor.

6.8 Operation close to overhead electric lines

- 6.8.1 When working with earthmoving machinery close to overhead electric lines and contact lines, a safety clearance dependent on the voltage rating of the overhead line must be kept between such lines and the earthmoving machine and its operating devices to prevent a voltage transfer. This also applies to the clearance between such lines and attachments or slung loads.
- 6.8.2 The following safety clearances are applicable in Germany:

Voltage rating	Safety clearance
up to 1000 V	1.0 m
more than 1 kV to 110 kV	3.0 m
more than 110 kV to 220 kV	4.0 m
more than 220 kV to 380 kV	
or for unknown voltage rating	5.0 m

- 6.8.3 All working movements of earthmoving machinery, e.g. the boom positions, the swinging of cables and the dimensions of slung loads must be taken into account, as must ground irregularities through which the earthmoving machine is tilted and thus comes closer to overhead lines.
Wind may make overhead lines and operating devices swing out, reducing the clearance.
- 6.8.4 If adequate clearance from electrical transmission lines and contact lines cannot be maintained, the contractor must implement other safety measures against voltage transfer by agreement with the owner or operator of the lines. This may be done, for example, by
 - switching off the current,

- moving the overhead line,
- cabling or
- limiting the working range of earthmoving machinery.

6.8.5 In the event of a voltage transfer, the following rules must be observed:

- Do not leave the operator's cab.
- Warn other persons not to approach or touch the machine.
- If possible, bring the operating device or the entire earthmoving machine out of the hazard zone.
- Have the current switched off.
- Never leave the machine until the contacted/damaged line has been switched off.

6.9 Operation below ground and in enclosed areas

If earthmoving machinery is used below ground or in enclosed areas, adequate ventilation must be provided and the valid regulations must be observed.

6.10 Stoppages

6.10.1 Prior to breaks or finishing work, the operator must move the earthmoving machine to level ground with an adequate bearing capacity and secure it from movement.

The operating devices must be set down or secured in such a way that no inadvertent movement is possible.

6.10.2 The operator must not leave the earthmoving machine unless the operating devices are set down or secured

6.10.3 Earthmoving machines must be parked only where they present no obstacle, e.g. to public highway or site traffic. If necessary they must be secured by warning devices such as warning triangles, warning cords, flashing or warning lamps.

6.10.4 Prior to leaving the operating stand, the operator must set all control devices to neutral and apply the brakes.

6.10.5 Before leaving the earthmoving machine, the operator must first switch off the driving motors and secure them against unauthorised starting.

6.11 Lifting-gear deployment

6.11.1 Lifting-gear deployment covers the lifting, transporting and lowering of loads by means of a slinging aid (cable, chain etc.), with the assistance of persons being required for slinging and releasing the load.

This means, for example, the lifting and lowering of pipes, shaft rings or containers with earthmoving machinery.

- 6.11.2 Earthmoving machinery must not be used in lifting-gear deployment unless the prescribed safety devices are present and fully functioning.

For hydraulic excavators, for example, these are:

- safe slinging facility for a load-bearing device,
- working load table,

and in addition for hydraulic excavators with a legal working load of more than 1000 kg or a overturning moment of more than 40 000 Nm

- overload warning system,
- open-circuit monitoring system(s) at boom lifting cylinder(s).

- 6.11.3 Loads must be slung in such a way that they cannot slip or fall out.
- 6.11.4 Persons involved in guiding the load and riggers must remain within the visual field of the machine operator.
- 6.11.5 The machine operator must keep loads as close as possible to the ground and prevent their swinging.
- 6.11.6 Earthmoving machinery must not be driven with a slung load unless the roadway is as even as possible.
- 6.11.7 When earthmoving machinery is in lifting-gear deployment, riggers may approach the boom only with the consent of the machine operator and only from the side. The machine operator must not give his consent unless the earthmoving machine is stationary and the operating device is not being moved.
- 6.11.8 No damaged or inadequately dimensioned slinging aids (cables, chains) must be used. Protective gloves must always be worn when working with slinging aids.

7 Assembly, servicing, repair (maintenance)

- 7.1 Earthmoving machinery must not be assembled, converted or dismantled except under the direction of qualified personnel appointed by the contractor and with the manufacturer's operating instructions being observed.
- 7.2 Work on such components as
- braking,

- steering,
- hydraulic and
- electrical systems

of the earthmoving machine must be performed by specially trained skilled personnel only.

- 7.3 Stability must be ensured at all times including during maintenance work.
- 7.4 The operating devices must be secured from moving by being set down on the ground or with equivalent measures, e.g. supporting sleeves or jacks. If necessary, the superstructure of excavators must be secured against swivelling.
- 7.5 In the case of earthmoving machinery with centre pivot steering, the pivot joint must be positively locked when work is being done in that area.
- 7.6 When installing and dismantling counterweights, they must be placed only at the locations prescribed by the manufacturer.
- 7.7 For jacking up earthmoving machinery, lifting gear must be used in such a way as to prevent any slippage. Tilted positions of the lifting gear or their inclined application are inadmissible.
- 7.8 Lifted earthmoving machinery must be secured by shoring up, e.g. with diagonal stacks of planks or squared timbers or with jacks.

Earthmoving machinery which is lifted with operating devices, must be supported immediately after being lifted. No work may be done under raised earthmoving machinery which is held in place only by the hydraulic system.

- 7.9 Prior to replacing the bucket scrapers of scraper vehicles or scraper-dozers, the scraper buckets must be set down on a non-tilting, unbreakable base.
- 7.10 Maintenance and repair work on scraper buckets must be done only when the closing flap is secured.
- 7.11 Prior to any maintenance and repair work, the driving motors must be stopped.

Only maintenance or repair work which cannot be carried out with a drive is exempt from these requirements. It must be ensured that the drive can be stopped immediately in any hazardous situation prior to beginning such work.

- 7.12 In the case of earthmoving machinery with a combustion engine, the battery must be disconnected prior to any work on the electrical system or any arc welding.
- 7.13 When disconnecting the battery, first the negative and then the positive pole must be disconnected. Reconnection is done in the reverse sequence.

- 7.14 The battery must be covered with insulating material if any maintenance work is done in its vicinity. No tools may be laid down on the battery.
- 7.15 In the case of electrically driven earthmoving machinery, the electrical systems and where necessary the mobile connection lines must be switched off and secured against inadvertent or unauthorised switching on.
- 7.16 Protective devices of moving machine parts must not be opened or removed unless the drive has been stopped and secured against unauthorised starting.
- Protective devices are, for example, motor compartment flaps, doors, guards, housings.
- 7.17 On completion of assembly, maintenance or repair work, all protective devices must be correctly mounted again.
- 7.18 Welding work on load-bearing parts of earthmoving machinery, e.g. lattice booms, lifting cranks, must be carried out in accordance with the recognised rules of welding technology.
- 7.19 No welding or drilling may be carried out on roll-over, tipp-over or fall-over protective structures (ROPS, TOPS, FOPS).
- 7.20 Modifications, e.g. welding on the hydraulic or compressed air system, must not be undertaken except with the authorisation of the manufacturer.
- 7.21 The control pressure, dynamic pressure and internal tank pressure must be reduced before starting work on the hydraulic system.
- 7.22 Only those hoses and lines prescribed by the manufacturer may be used.
- 7.23 Hydraulic hoses and lines must be skilfully laid and installed.
- 7.24 Smoking and the use of open flames are forbidden during refuelling.
- 8 Recovery, towing, transport
- 8.1 The recovery and towing of earthmoving machinery must be done with adequately dimensioned towing devices only.
- 8.2 The towing points or blocks prescribed by the manufacturer, e.g. lugs, hooks, must be used.
- 8.3 The towing vehicle must be driven slowly. All persons must keep out of the range of towing devices.

- 8.4 During loading and transport, earthmoving machinery and any necessary auxiliary devices must be secured against inadvertent movement.
- 8.5 The travelling gear and crawler unit of earthmoving machinery must be cleaned of mud, snow and ice to such an extent that ramps can be negotiated without a risk of slippage.
- 8.6 Low-loader access ramps must be fitted with wooden planks before being negotiated by tracked vehicles.
- 8.7 Before the actual transport, the route to be covered should be inspected to ensure that the roads are wide enough, bridge and underpass openings large enough, and roads, tracks and bridges are strong enough.

9 Supervision

- 9.1 The prescribed deadlines for recurring tests must be observed.
- 9.2 Before starting his work, the machine operator must also check as specified by the manufacturer that safety, driving and operating devices, e.g. overload warning system, brakes, steering, lighting, are fully functioning.

When mounting operating devices on quick-change systems, the firm fit of the operating device must be checked by moving it in all directions. During this process, all persons must keep out of the hazard zone.

- 9.3 Hydraulic hoses must be replaced as soon as the following damage is noticeable:
 - damage to the outer layer through to the intermediate layer,
 - brittleness in the outer layer,
 - distortions in pressurised or unpressurised state not conforming with the original shape of the installed hose,
 - leakages,
 - damage to the hose fittings or to the connection between fittings and hose,
 - storage damage (the shelf life of the hose should not exceed 2 years),
 - damage resulting from exceeding the standard service life (the service life under normal conditions should not exceed 6 years).
- 9.4 The coolant level must be checked only when the lid is cool; the lid must be turned carefully to reduce the pressure.
- 9.5 The machine operator must report any recorded defects without delay to the supervisor and, in the event of a change of operator, to the operator replacing him.
- 9.6 In the event of defects endangering the operational safety of the earthmoving machine, it must be taken out of operation until the defects have been rectified.

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